

	Espacio reservado para el adhesivo de radicación
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DIRECCIÓN DE NUEVAS CREACIONES
Procedimiento acelerado de exámenes de patente (PPH)

1	NÚMERO DE SOLICITUD ANTE LA SIC		
2	GLOBAL - PPH ☐ PAÍS	3	PCT – PPH ☐ PAÍS
4	PROSUR ☐ PAÍS	5	Alianza del Pacifico (AdP) ☐ PAÍS
6	OFICINA DE PRIMERA PRESENTACIÓN (OPP) ☒	7	OFICINA DE EXAMEN ANTERIOR (OEA) ☐
8	NÚMERO DE SOLICITUD O PUBLICACIÓN DE LA SOLICITUD (OPP) ☒ NÚMERO DE SOLICITUD EN OFICINA DE EXAMEN ANTERIOR (OEA): ☐ NÚMERO DE SOLICITUD PCT: ☐		1. 14169923.1 (EP2949707)
9	☐ REPRESENTANTE LEGAL ☒ APODERADO		
APELLIDOS DAZA MONTALVO		NOMBRES CAROLINA MERCEDES	IDENTIFICACIÓN C.C .66783790 T.P .141563 CSJ
DIRECCIÓN Carrera 11 No. 86-53 Piso 3		No. TELÉFONO 6181088	
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PAÍS COLOMBIA		No. RADICACIÓN O PROTOCOLO DE PODER GENERAL	
10	CONDICIONES PARA ACCEDER A ESTE PROCESO:		
10.1. DATOS DE PRIORIDAD ☒ SI ☐ NO			
(33) PAÍS DE ORIGEN 1.EUROPEAN PATENT ORG-EPO 2.ESTADOS UNIDOS DE AMÉRICA		CÓDIGO PAÍS EU US	(31) NÚMERO 14169923.1 62/018,772 (32) FECHA (AAAA/MM/DD) 2014/05/26 2014/06/30
10.2. DATOS SOLICITUD INTERNACIONAL PCT ☐ SI ☐ NO			
Solicitud Internacional No. PCT/EP2015/061229		Fecha 2015/05/21	
Publicación Internacional No. WO/2015/181037		Fecha 2015/12/03	
*El solicitante presenta una copia de la(s) reivindicación(es) patentable(s) u otorgable(s) de la solicitud de la Oficina de Primera Presentación que profirió el examen de patentabilidad, junto con una traducción al castellano. ☒ SI ☐ NO *El solicitante presenta los resultados de búsqueda de la Oficina de Examen Anterior, junto con una traducción al castellano ☒ SI ☐ NO			
REQUISITOS PARA EL RECONOCIMIENTO DE LOS RESULTADOS DE EXÁMENES DE PATENTABILIDAD EFECTUADOS A SOLICITUDES EXTRANJERAS Para que la Superintendencia de Industria y Comercio pueda reconocer los resultados de exámenes de patentabilidad producidos por otras Oficinas de Propiedad Industrial se debe cumplir con las siguientes condiciones: (a) Al momento de solicitar el examen de patentabilidad, si el solicitante pide que se reconozcan exámenes de patentabilidad de otras oficinas extranjeras, deberá aportar junto con el pago de la tasa correspondiente, los siguientes anexos: (i) Copia de las resoluciones, fallos o decisiones que han sido relevantes para la determinación de la patentabilidad de la(s) solicitud(es) en la Oficina que haya proferido el examen de patentabilidad que contienen reivindicaciones patentables u otorgables que son la base de la petición, y si es del caso, su traducción al castellano. ☒ SI ☐ NO (ii) Copia de todas las reivindicaciones determinadas como patentables u otorgables en la Oficina que profirió el examen de patentabilidad y, si es del caso, su traducción al castellano. ☒ SI ☐ NO (iii) Copia de los antecedentes, información o documentos citados por el examinador de la Oficina de Primera Presentación del examen de patentabilidad, en las resoluciones, fallos o decisiones correspondientes, incluyendo la literatura no patente. Los documentos de patente deberán presentarse siempre y cuando no estén disponibles para la Superintendencia de Industria y Comercio mediante el simple acceso a bases de datos gratuitas. ☒ SI ☐ NO (iv) Una tabla de correspondencias de las reivindicaciones que han sido determinadas como patentables u otorgables en la solicitud de la Oficina que haya proferido el examen de patentabilidad. ☒ SI ☐ NO			
11	FIRMA DEL SOLICITANTE, DEL APODERADO O DEL REPRESENTANTE LEGAL Junto a cada firma, indicar el nombre del firmante y su calidad (si tal calidad no es obvia al leer el petitorio)		
 CAROLINA DAZA MONTALVO			

Questions about this communication ?

Contact Customer Services at www.epo.org/contact



Boos, Melanie
Maiwald Patentanwalts GmbH
Elisenhof
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80335 München
ALLEMAGNE

Date

02.02.17

Reference O 9851 / HG	Application No./Patent No. 14169923.1 - 1375 / 2949707
Applicant/Proprietor Omya International AG	

Decision to grant a European patent pursuant to Article 97(1) EPC

Following examination of European patent application No. 14169923.1 a European patent with the title and the supporting documents indicated in the communication pursuant to Rule 71(3) EPC (EPO Form 2004C) or in the information (EPO Form 2004W, cf. Notice from the EPO dated 8 June 2015, OJ EPO 2015, A52) dated 23.09.16 is hereby granted in respect of the designated Contracting States.

Patent No. : 2949707
Date of filing : 26.05.14
Priority claimed : /

Designated Contracting States
and Proprietor(s) : AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI
LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Omya International AG
Baslerstrasse 42
4665 Oftringen/CH

This decision will take effect on the date on which the European Patent Bulletin mentions the grant (Art. 97(3) EPC).

The mention of the grant will be published in European Patent Bulletin 17/09 of 01.03.17.

Examining Division

Siebel E

Corrias M

Marino E



ANMERKUNG ZUR ENTSCHEIDUNG ÜBER DIE ERTEILUNG
EINES EUROPÄISCHEN PATENTS (EPA Form 2006)

1. **EPA Informationsbroschüre "Nationales Recht zum EPÜ"**

Diese Broschüre enthält nützliche Informationen zu den formalen Erfordernissen und den Handlungen, die vor den Patentbehörden der Vertragsstaaten vorzunehmen sind, um Rechte in diesen Staaten zu erlangen. Da diese Handlungen einem ständigen Wandel unterworfen sind, sollte immer nur die neueste Ausgabe der Broschüre benutzt werden. Nachträgliche Informationen werden im Amtsblatt veröffentlicht.

2. **Übersetzung der europäischen Patentschrift nach Artikel 65 (1) des Europäischen Patentübereinkommens**

Sie werden erneut darauf hingewiesen, dass bestimmte Vertragsstaaten nach Artikel 65 (1) EPÜ eine Übersetzung der europäischen Patentschrift verlangen; hierauf wird in der Mitteilung gemäß Regel 71 (5) EPÜ verwiesen. Die Nichteinreichung dieser Übersetzung kann zur Folge haben, dass das Patent in dem betreffenden Staat/in den betreffenden Staaten als von Anfang an nicht eingetreten gilt. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

3. **Zahlung von Jahresgebühren für europäische Patente**

Nach Artikel 141 EPU können "nationale" Jahresgebühren für das europäische Patent für die Jahre erhoben werden, die an das Jahr anschließen, in dem der Hinweis auf die Erteilung des europäischen Patents im "Europäischen Patentblatt" bekanntgemacht wird. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

NOTE RELATING TO THE DECISION TO GRANT A
EUROPEAN PATENT (EPO Form 2006)

1. **EPO Information Brochure "National law relating to the EPC"**

This brochure provides useful information regarding formal requirements and the steps to be taken before the patent authorities of the Contracting States in order to acquire rights in those states. Since the necessary steps are subject to change the latest edition of the brochure should always be used. Subsequent information is published in the Official Journal.

2. **Translation of the European patent application under Article 65(1) of the European Patent Convention**

Your attention is again drawn to the requirements regarding translation of the European patent specification laid down by a number of Contracting States under Article 65(1) EPC, to which reference is made in the communication under Rule 71(5) EPC. Failure to supply such translation(s) may result in the patent being deemed to be void "ab initio" in the State(s) in question. For further details you are recommended to consult the above-mentioned brochure.

3. **Payment of renewal fees for European patents**

Under Article 141 EPC "national" renewal fees in respect of a European patent may be imposed for the years which follow that in which the mention of the grant of the European patent is published in the "European Patent Bulletin". For further details you are recommended to consult the above-mentioned brochure.

REMARQUE RELATIVE A LA DECISION DE DELIVRANCE
D'UN BREVET EUROPEEN (OEB Form 2006)

1. **Brochure d'information de l'OEB "Droit national relatif à la CBE"**

Cette brochure fournit d'utiles renseignements sur les conditions de forme requises et sur les actes à accomplir auprès des offices de brevet des Etats contractants aux fins d'obtenir des droits dans les Etats contractants. Etant donné que les actes indispensables sont susceptibles de modifications, il serait bon de toujours consulter la dernière édition de la brochure. Toute information ultérieure est publiée au Journal Officiel.

2. **Traduction du fascicule du brevet européen en vertu de l'article 65(1) de la Convention sur le brevet européen**

Votre attention est de nouveau attirée sur l'obligation faite par certains Etats contractants, en vertu de l'article 65(1) CBE, de fournir une traduction du fascicule du brevet européen, à laquelle il est fait référence dans la notification établie conformément à la règle 71(5) CBE. Si la(les) traduction(s) n'est(ne sont) pas fournie(s), le brevet européen peut, dès l'origine, être réputé sans effet dans cet(ces) Etat(s). Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

3. **Paiement des taxes annuelles pour le brevet européen**

Conformément à l'article 141 CBE des taxes annuelles "nationales" dues au titre du brevet européen peuvent être perçues pour les années suivant celle au cours de laquelle la mention de la délivrance du brevet européen est publiée au "Bulletin européen des brevets". Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.



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Application No. 14 169 923.1 - 1375 ✓	Ref. O 9851 /HG ✓	Date 16.08.2016
Applicant Omya International AG ✓		

Communication under Rule 71(3) EPC

1. Intention to grant

You are informed that the examining division intends to grant a European patent on the basis of the above application, with the text and drawings and the related bibliographic data as indicated below.

A copy of the relevant documents is enclosed.

1.1 In the text for the Contracting States:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT
RO RS SE SI SK SM TR

Description, Pages

1-73 filed in electronic form on 21-06-2016

Claims, Numbers

1-15 filed in electronic form on 21-06-2016

Drawings, Sheets

1/1 as originally filed

1.2 Bibliographic data

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated contracting states, the registered name(s) of the applicant(s) and the other bibliographic data are shown on **EPO Form 2056** (enclosed).

2. Invitation

You are invited, **within a non-extendable period of four months** of notification of this communication,

2.1 to EITHER approve the text communicated above and verify the bibliographic data (Rule 71(5) EPC)

(1) by filing a translation of the claim(s) in the other two official languages of the EPO

	Fee code	EUR
(2a) by paying the fee for grant including the fee for publication: minus any amount already paid (Rule 71a(5) EPC):	007	925.00 0.00

Total amount: 925.00

(3) by paying additional claims fees under Rule 71(4) EPC; number of claims fees payable: 0 minus any amount already paid (Rule 71a(5) EPC):	016	0.00 0.00
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Total amount: 0.00

Important: If the translations of the claims and fees have already been filed and paid respectively in reply to a previous communication under Rule 71(3) EPC, e.g. in the case of resumption of examination after approval (see Guidelines C-V, 6), **agreement as to the text to be granted** (Rule 71a(1) EPC) must be expressed within the same time limit (e.g. by approving the text and verifying the bibliographic data, by confirming that grant proceedings can go ahead with the documents on file and/or by stating which translations of the claims already on file are to be used).

Note 1: See "Important notes concerning fee payments" below.

Note 2: Any overpaid "minus" amounts will be refunded when the decision to grant (EPO Form 2006A) has been issued.

Note 3: For the calculation of the grant fee under Article 2(2), No. 7, RFees (old fee structure), the number of pages is determined on the basis of a clean copy of the application documents, in which text deleted as a result of any amendments by the examining division is not shown. Such clean copy is made available via on-line file inspection only.

2.2 OR, in the case of disapproval, to request reasoned amendments or corrections to the text communicated above or keep to the latest text submitted by you (Rule 71(6) EPC).

In this case the translations of the claims and fee payments mentioned under point 2.1 above are NOT due.

The terms "amendment(s)" and "correction(s)" refer only to amendments or corrections of the application documents and not of other documents (e.g. bibliographic data, the designation of the inventor, etc.).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the examining division requesting that you correct this deficiency (Rule 137(4) EPC).

2.3 Bibliographic data

Where you request a change or correction of bibliographic data in response to the Rule 71(3) communication, this will **not** cause the sending of a further communication under Rule 71(3) EPC. You will still have to pay the fees and file translations in reply to the Rule 71(3) communication in the case of 2.1 above, unless you also file

a reasoned request for amendments or corrections in response to the Rule 71(3) communication (see case 2.2 above).

3. Loss of rights

If neither of the two possible actions above (see points 2.1 or 2.2) is performed in due time, the European patent application will be deemed to be withdrawn (Rule 71(7) EPC).

4. Further procedure

4.1 In the case of point 2.1 above

- 4.1.1 The decision to grant the European patent will be issued, and the **mention of the grant** of the patent will be published in the European Patent Bulletin, if the requirements concerning the translation of the claims and the payment of all fees are fulfilled and there is agreement as to the text to be granted (Rule 71a(1) EPC).

Note on payment of the renewal fee:

If a renewal fee becomes due before the next possible date for publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (Rule 71a(4) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Note on payment of the designation fee(s):

If the designation fee(s) become(s) due after the communication under Rule 71(3) EPC, the mention of the grant of the European patent will not be published until these fees have been paid (Rule 71a(3) EPC).

- 4.1.2 After publication, the **European patent specification** can be downloaded free of charge from the EPO publication server <https://data.epo.org/publication-server> or ordered from the Vienna sub-office upon payment of a fee (OJ EPO 2005, 126).

4.1.3 Filing of translations in the contracting states

As regards translation requirements prescribed by the contracting states under Article 65(1) EPC, please consult the website of the European Patent Office

www.epo.org → Law & practice → Legal texts, National law relating to the EPC

www.epo.org → Law & practice → All Legal texts → London Agreement

In the case of a valid extension or validation

As regards translation requirements prescribed by the extension or validation states, please consult the website of the European Patent Office

www.epo.org → Law & practice → Legal texts, National law relating to the EPC

Failure to supply a prescribed translation in a contracting state, or in an extension or validation state may result in the patent being deemed to be void *ab initio* in the state concerned (Art. 65(3) EPC).

4.2 In the case of 2.2 above

If the present communication under Rule 71(3) EPC is based on an auxiliary request and, within the time limit, you maintain the main request or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the examining division gives its consent to the requested amendments or corrections, it will issue a new communication under Rule 71(3) EPC; otherwise, it shall resume the examination proceedings

(Rule 71(6) EPC).

5. Filing of a divisional application

Any divisional application relating to this European patent application must be filed directly with the European Patent Office in Munich, The Hague or Berlin and will be in the language of the proceedings for the present application, or if the latter was not in an official language of the EPO, the divisional application may be filed in the language of the present application as filed (see Article 76(1) and Rule 36(2) EPC). Any such divisional application must be filed while the present application is still pending (Rule 36(1) EPC; Guidelines A-IV, 1.1.1).

6. Important notes concerning fee payments

6.1 For all payments, please refer to the relevant **fee code(s)**.

6.2 Automatic debiting procedure

The fee for grant, including the fee for publication, and any additional claims fees due under Rule 71(4) EPC will be debited automatically on the date of filing of the translations of the claims, or on the last day of the period of this communication. However, if the designation fee(s) become(s) due as set out in Rule 71a(3) EPC and/or a renewal fee becomes due as set out in Rule 71a(4) EPC, these should be paid separately by another permitted way of payment in order not to delay the publication of the mention of the grant. The same applies in these circumstances to the payment of extension and validation fees. For further details see the Arrangements for the automatic debiting procedure (AAD) and accompanying information from the EPO concerning the automatic debiting procedure (Annexes A.1 and A.2 to the Arrangements for deposit accounts (ADA) in Supplementary publication - OJ EPO 3/2015).

Note: If a waiver is expressed in response to a Rule 71(3) communication (see OJ EPO 2015, A52), the fee for grant, including the fee for publication/printing, and any additional claims fees will not be debited automatically. These fees must be paid separately by another means of payment allowed under the Rules relating to Fees.

6.3 Important information relating to fee amounts

Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment**. The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (www.epo.org) and can be found under www.epo.org/schedule-of-fees, which allows the viewing, downloading and searching for individual fee amounts, both current and previous. Please note that procedural fees are usually adjusted every two years, on even years, with effect from 1 April.

Examining Division:

Chairman:	Marino, Emanuela
2nd Examiner:	Corrias, M
1st Examiner:	Siebel, Eric



Lekahena, Clifford
For the Examining Division
Tel. No.: +31 70 340 - 2691

Branch at The Hague

Enclosures: Text intended for grant

EPO Form 2056

Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 14 169 923.1

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention:

- VERFAHREN ZUR HERSTELLUNG VON BROCKEN MIT CALCIUMCARBONAT ✓
- PROCESS FOR THE PREPARATION OF CRUMBS COMPRISING CALCIUM CARBONATE ✓
- PROCÉDÉ DE PRÉPARATION DE MIETTES COMPRENANT DU CARBONATE DE CALCIUM

Classification: INV. C09C1/02 C08K3/00 C01F11/18 C08K3/26 C09C3/04 C09C3/08 C08K9/04

Date of filing: 26.05.2014 ✓

Priority claimed:

Contracting States*
for which fees have been paid:

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR ✓

Extension States*
for which fees have been paid:

BA ME ✓

Validation States*
for which fees have been paid:

Applicant(s):**

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ORTEN, Rolf Endre
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6424 Molde
NO S

- *) If the time limit for the payment of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States/Validation States** are currently still deemed to be designated. See also Rule 71a(3) EPC and, if applicable, the above Note to users of the automatic debiting procedure.
- **) If two or more applicants have designated different Contracting States, this is indicated here.

5 OMYA INTERNATIONAL AG
Our reference: O 9851 / HG

Munich, 21 June 2016

10 Omya International AG
Baslerstraße 42
4665 Oftringen
Switzerland

15 -----
Process for the preparation of crumbles comprising calcium carbonate

20 The present invention relates to crumbles comprising at least one calcium carbonate-containing material, a process for the preparation of the crumbles, an article comprising the crumbles as well as an use of the crumbles in paper making, paper coating, food, plastic, agricultural, paint, coatings, adhesives, sealants, pharmaceuticals, agricultural, construction and/or cosmetic applications.

25 In practice, filler materials and especially calcium carbonate-containing materials are often used as particulate fillers in a great variety of applications, such as in paper making, paper coating, food, plastic, agricultural, paint, coatings, adhesives, pharmaceuticals, agricultural, construction and cosmetic applications. Materials of
30 this type are usually sold by the manufacturer in the form of aqueous slurries having a distinct water-insoluble solid content. However, such slurries have the disadvantage that, in order to keep the calcium carbonate-containing material in suspension, the addition of dispersants is required. Water-soluble polymers and copolymers which may be used as e.g. dispersant in such slurries are, for example,

- 2 -

described in US 5,278,248. However, dispersants may interfere with some optical properties such as opacity, light scattering and brightness when incorporated in the ultimate product, e.g. paper coatings, and thus the demand for dispersant-free slurries of calcium carbonate-containing materials is increasing. Furthermore, the

5 aforementioned slurries are often subject to contamination by microorganisms such as aerobic and anaerobic bacteria resulting in changes in the slurry characteristics such as changes in viscosity and/or pH, discolorations, unpleasant odour or reductions in other quality parameters, which negatively affect their commercial value. Therefore, the manufacturers of such slurries usually take measures for

10 stabilizing the slurries in that biocides are added into such slurries, which may, however, interfere with optical and/or mechanical properties or legal requirements of the ultimate product. Furthermore, slurries are of a relatively high volume and weight and thus less total amount of a calcium carbonate-containing material in form of slurry is transported to a customer's place by the same loading compared to a

15 powder.

In order to avoid the addition of dispersants and/or biocides into the slurries, said calcium carbonate-containing materials are alternatively sold by the manufacturer in the form of a powder. However, these dry powders have the disadvantage that they

20 have a low bulk density and flow properties at high dusting, which make them difficult to handle due to the need of special equipment dealing with the flow and dusting characteristics of the powder and its higher storage capacity.

In the past, efforts have been made to increase the bulk density of such powders using energy consuming compaction equipment, such as bricketting machines or

25 pelletizers. However, these have proved to be unacceptable for several reasons. When the bulk density of such powders is increased mechanically by pressure, the flow properties of such powders are usually getting worse. Higher energy input is needed to load the product into a tank or container or to empty such a tank or

- 3 -

- container. Further, pelletizing equipment, which relies upon water as a binder, has been found to require the addition of large quantities of water (roughly 15 to 25 wt.-% of the weight of the calcium carbonate) before acceptable pellets can be formed. This water either increases the shipping costs of the product or increases
- 5 production costs because it must be evaporated prior to shipment. Pelletizing equipment relying upon binders other than water also requires large amounts of binder and is found to result in a pelletized product which is difficult to make-down in water after pelletization and drying.
- 10 Furthermore, calcium carbonate-containing materials are generally prepared by dry grinding or wet grinding and subsequent drying. For example, WO 2010/098821 A2 refers to mineral pigments (such as kaolin clay) having a high surface area and particle size in the nano scale range. These pigments are manufactured by intensive wet milling of a mineral composition which may have undergone prior dry grinding
- 15 and then optionally subjecting the wet milled mineral composition to an acid treatment. WO 2013/061068 A1 refers to particulate fillers which possess no, or very low, amounts of coarse material, compositions comprising said fillers and uses thereof. The method of removing coarse particles from a particulate material comprises: dry sieving or sifting the particulate material to produce the particulate
- 20 filler. WO 2009/009553 A1 refers to precipitated calcium carbonate compositions that are characterized by having a crystalline aragonite content of greater than or equal to about 30% by weight relative to the total weight of the composition, less than or equal to about 10% by weight of particles having a particle size less than or equal to about 0.25 microns, less than or equal to about 4% by weight of particles
- 25 having a particle size greater than or equal to about 2.0 microns, and a particle size distribution steepness of greater than or equal to about 50. It is further referred to a method of making a precipitated calcium carbonate composition, wherein the composition has an aragonite content of greater than or equal to about 30% by weight relative to the total weight of the composition; including the step of
- 30 performing centrifugation of the composition to remove coarse particles such that

- 4 -

less than or equal to about 4% by weight of the particles have a particle size greater than or equal to about 2.0 microns. EP 2 194 103 A1 refers to a process for manufacturing calcium carbonate materials having a particle surface with improved adsorption properties of dispersant comprising the steps of: a. providing at least one
5 calcium carbonate comprising material in the form of an aqueous suspension or in dry form, b. providing at least one lithium ion containing compound selected from the group consisting of lithium hydroxide or lithium oxide or inorganic and/or organic monomeric lithium salts, c. combining the at least one lithium ion containing compound of step b) with the at least one calcium carbonate material of step a). WO
10 2004/016566 A1 refers to method for preparing a pigment composition, the method consists essentially of the steps of providing a precipitated calcium carbonate having a median particle size, by weight, of less than about 1.6 micrometers; providing a ground calcium carbonate having a median particle size, by weight, of less than about 0.8 micrometers; and mixing the precipitated calcium carbonate with the
15 ground calcium carbonate in a weight ratio of precipitated calcium carbonate to ground calcium carbonate of from about 3:2 to about 1:9 to form the pigment composition.

However, in order to obtain a fine calcium carbonate-containing material, the energy
20 input, especially during dry grinding, is relatively high. In addition thereto, the parameters in wet and dry grinding processes are not that adjustable that a defined ground material having a controlled particle size distribution, BET surface area and top cut can be obtained. Thus, the material obtained is usually subjected to further steps after grinding in order to remove certain impurities such as ionic and/or
25 chemical components or to remove certain particle fractions for obtaining a material meeting the desired needs. Furthermore, the moisture pick-up susceptibility of such materials is relatively high, especially when prepared in the presence of dispersants which again may interfere with optical and/or mechanical properties of the ultimate product.

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Therefore, there is a continuous need in the art for a calcium carbonate-containing material which avoids the disadvantages of slurries, namely the incorporation of dispersants and/or biocides. Furthermore, there is a need in the art for a calcium carbonate-containing material which offers the advantages of a powder as regards the transportation but avoids its disadvantages, namely the low bulk density and flow at high dusting of powders. In particular, it is desirable to prepare a calcium carbonate-containing material having controlled particle size distribution, BET surface area, top cut and moisture pick-up susceptibility at low energy input and which can be used as dry product or which can be easily made into a slurry at the costumers site depending on the costumers needs.

Accordingly, it is an object of the present invention to provide a calcium carbonate-containing material that significantly reduces the disadvantages of the prior art. A further objective is to provide a calcium carbonate-containing material being free of biocides and/or dispersants. Another objective of the present invention is to provide a calcium carbonate-containing material having high bulk density and flow properties at low dusting. A further objective of the present invention is to provide a calcium carbonate-containing material of which more tons per loading can be transported compared to a slurry comprising the same amount of calcium carbonate-containing material. An even further objective of the present invention is to provide a calcium carbonate-containing material having a controlled particle size distribution, BET surface area and top cut that can be easily prepared with low energy input. A still further objective of the present invention is to provide a calcium carbonate-containing material having a low moisture pick-up. Another objective of the present invention is to provide a calcium carbonate-containing material which can be used as a dry product or which can be easily made into a slurry.

The foregoing and other objectives are solved by the subject-matter as defined herein in claim 1.

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According to one aspect of the present application crumbles comprising at least one calcium carbonate-containing material are provided. The crumbles

- a) having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles,
- 5 b) comprising particles of the at least one calcium carbonate-containing material having a
 - i) weight particle size d_{75} of 0.7 to 3.0 μm ,
 - ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,
 - iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the
- 10 c) comprising particles of the at least one calcium carbonate-containing material having a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010).

15

The inventors surprisingly found out that the foregoing crumbles according to the present invention can be easily prepared at low energy input with satisfactorily high bulk density and flow properties at low dusting. In addition thereto, more tons per loading of the foregoing crumbles can be transported compared to a slurry comprising

20 the same amount of the calcium carbonate-containing material. Furthermore, the foregoing crumbles according to the present invention have controlled particle size distribution, BET surface area and top cut, have low moisture pick-up susceptibility and are free of biocides and/or dispersants. In addition thereto, the foregoing crumbles can be used as a dry product or can be easily made into a slurry. More

25 precisely, the inventors found that the mechanical and optical properties as well as the handling of a calcium carbonate-containing material can be improved by a material having specific solids content and particle size distribution as defined herein.

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According to another aspect of the present invention, a process for the preparation of crumbles comprising at least one calcium carbonate-containing material as defined herein is provided. The process comprising the steps of:

- a) providing at least one calcium carbonate-containing material in the form of an aqueous slurry having solids content in the range from 5.0 to 45.0 wt.-%, based on the total weight of the slurry,
- b) wet grinding the at least one calcium carbonate-containing material of step a) to obtain an aqueous slurry of the at least one wet-ground calcium carbonate-containing material, wherein the particles of the at least one wet-ground calcium carbonate-containing material have a
 - i) weight particle size d_{75} of 0.7 to 3.0 μm ,
 - ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,
 - iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and
 - iv) a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010),
- c) mechanical dewatering of the aqueous slurry of step b) to obtain crumbles comprising the at least one calcium carbonate-containing material having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles.

It is preferred that the aqueous slurry of the at least one calcium carbonate-containing material of step a) is free of dispersing agents and/or wet-grinding step b) and/or mechanical dewatering step c) is/are carried out in the absence of dispersing agents.

- It is further preferred that the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) has a) lower solids content than the aqueous slurry of the at least one calcium carbonate-containing material provided in step a), and/or b) solids content in the range from 10.0 to 35.0 wt.-%, based on the total weight of the slurry. It is even further preferred that process step b) is carried out in the presence of at least one further particulate filler material, preferably at least

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one further particulate filler material selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica,

5 carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof. It is still further preferred that the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) is partially dewatered to solids content in the range from 20.0 to 40.0 wt.-%, based on the total weight of the slurry, before process step c) is carried out. It is also preferred that

10 process step c) is carried out under pressure, preferably a pressure from 20.0 bar to 140.0 bar, more preferably from 65.0 bar to 120.0 bar and most preferably from 80.0 to 110.0 bar. It is further preferred that process step c) is carried out in a vertical plate pressure filter, a tube press or a vacuum filter, preferably in a tube press. It is still further preferred that the process further comprises step d) of a) treating the crumbles

15 comprising the at least one calcium carbonate-containing material obtained in step c) with a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of

20 carbon atoms from C2 to C30 in the substituent and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and one or more phosphoric acid di-ester, to obtain surface-treated crumbles comprising on at least a part of the accessible surface area of the calcium carbonate-containing material particles a treatment layer comprising the hydrophobizing agent, and/or b) drying the crumbles comprising the

25 at least one calcium carbonate-containing material obtained in step c) to solids content of ≥ 97.0 wt.-%, and most preferably from 97.0 to 99.98 wt.-%, based on the total weight of the crumbles, and/or c) dispersing the crumbles by using a polyacrylate-based dispersant.

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According to an even further aspect of the present invention, an article comprising the crumbles comprising at least one calcium carbonate-containing material is provided. According to one embodiment, the article is selected from the group comprising plastic, food, cosmetic, sealant, pharmaceutical, paper, paper coating,
5 coating, paint, adhesive articles and mixtures thereof.

According to still another aspect of the present invention, an use of crumbles comprising at least one calcium carbonate-containing material in paper making, paper coating, food, plastic, agricultural, paint, coating, adhesive, sealant,
10 pharmaceutical, agricultural, construction and/or cosmetic applications, is provided.

Advantageous embodiments of the inventive crumbles are defined in the corresponding sub-claims.

15 According to one embodiment the at least one calcium carbonate-containing material is at least one natural calcium carbonate-containing material, preferably dolomite and/or at least one ground calcium carbonate (GCC), more preferably at least one ground calcium carbonate (GCC) and most preferably at least one ground calcium carbonate (GCC) selected from the group comprising marble, chalk, limestone and
20 mixtures thereof.

According to another embodiment the crumbles comprise a) at least one further particulate filler material, preferably at least one further particulate filler material selected from the group comprising precipitated calcium carbonate (PCC), metal
25 oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof, and/or b) on at least a part of the accessible surface area of the calcium carbonate-containing material particles a
30 treatment layer comprising a hydrophobizing agent, preferably an aliphatic

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carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or reaction products thereof and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms
5 from C2 to C30 in the substituent and/or reaction products thereof and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and/or reaction products thereof and one or more phosphoric acid di-ester and/or reaction products thereof.

10 According to yet another embodiment the crumbles have a) a moisture pick up susceptibility such that its total surface moisture level is ≤ 0.6 mg/g, preferably ≤ 0.5 mg/g, more preferably ≤ 0.4 mg/g and most preferably ≤ 0.3 mg/g of the dry crumbles after exposure to an atmosphere of 50% of relative humidity for 48 hours at a temperature of 23°C, and/or b) a moisture content of from 0.2 wt.-% to 0.6 wt.-%,
15 preferably from 0.2 wt.-% to 0.4 wt.-% and most preferably from 0.25 wt.-% to 0.35 wt.-%, based on the total dry weight of the crumbles.

It should be understood that for the purpose of the present invention, the following terms have the following meaning.

20

For the purpose of the present invention, the term “crumbles” comprising at least one calcium carbonate-containing material refers to a material being composed of a plurality of particles comprising the at least one calcium carbonate-containing material and moisture such that the crumbles have solids content of 78.0 wt.-% to
25 90.0 wt.-%, based on the total weight of the crumbles.

The term “calcium carbonate-containing material” refers to a material that comprises at least 50.0 wt.-% calcium carbonate, based on the total dry weight of the calcium carbonate-containing material.

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Throughout the present document, the “particle size” of a particulate material is described by its distribution of particle sizes. The value d_x represents the diameter relative to which x % by weight of the particles have diameters less than d_x . This means that the d_{25} value is the particle size at which 25.0 wt.-% of all particles are
5 smaller, and the d_{75} value is the particle size at which 75.0 wt.-% of all particles are smaller. The d_{50} value is thus the weight median particle size, i.e. 50.0 wt.-% of all particle grains are bigger or smaller than this particle size. For the purpose of the present invention the particle size is specified as weight median particle size d_{50} unless indicated otherwise. For determining the weight median particle size d_{50}
10 value, a Sedigraph™ 5120 or a Sedigraph™ 5100 device from the company Micromeritics Instrument Corporation, USA can be used.

A “specific surface area” (SSA) of a particulate material in the meaning of the present invention is defined as the surface area of the particulate material divided by
15 the mass of the particulate material. As used herein, the specific surface area is measured by adsorption using the BET isotherm (ISO 9277:2010), and is specified in m^2/g .

Where the term “comprising” is used in the present description and claims, it does
20 not exclude other elements. For the purposes of the present invention, the term “consisting of” is considered to be a preferred embodiment of the term “comprising of”. If hereinafter a group is defined to comprise at least a certain number of embodiments, this is also to be understood to disclose a group, which preferably consists only of these embodiments.

25

Where an indefinite or definite article is used when referring to a singular noun, e.g. “a”, “an” or “the”, this includes a plural of that noun unless something else is specifically stated.

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Terms like “obtainable” or “definable” and “obtained” or “defined” are used interchangeably. This means that, unless the context clearly dictates otherwise, the term “obtained” does not mean to indicate that an embodiment must be obtained by, e.g. the sequence of steps following the term “obtained” even though such a limited
5 understanding is always included by the terms “obtained” or “defined” as a preferred embodiment.

In the following, the details and preferred embodiments of the inventive crumbles will be described in more detail. It is to be understood that these technical details and
10 embodiments also apply to the inventive process for the preparation of the crumbles, the inventive article and its use.

Crumbles comprising at least one calcium carbonate-containing material

15 According to the instant invention, the crumbles comprise at least one calcium carbonate-containing material.

The term “at least one” calcium carbonate-containing material in the meaning of the present invention means that the calcium carbonate-containing material comprises,
20 preferably consists of, one or more calcium carbonate-containing material.

In one embodiment of the present invention, the at least one calcium carbonate-containing material comprises, preferably consists of, one calcium carbonate-containing material. Alternatively, the at least one calcium carbonate-containing
25 material comprises, preferably consists of, two or more calcium carbonate-containing materials. For example, the at least one calcium carbonate-containing material comprises, preferably consists of, two or three calcium carbonate-containing materials.

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Preferably, the at least one calcium carbonate-containing material comprises, more preferably consists of, one calcium carbonate-containing material.

According to one embodiment of the present invention, the at least one calcium
5 carbonate-containing material is at least one natural calcium carbonate-containing material.

The term “natural” calcium carbonate-containing material in the meaning of the present invention refers to a calcium carbonate-containing material obtained from
10 natural sources, such as limestone, marble, chalk and/or dolomite, and processed through a wet and/or dry treatment such as grinding, screening and/or fractionation, for example by a cyclone or classifier.

According to one embodiment of the present invention, the at least one calcium
15 carbonate-containing material, preferably the at least one natural calcium carbonate-containing material, is dolomite and/or at least one ground calcium carbonate (GCC). More preferably, the at least one calcium carbonate-containing material, preferably the at least one natural calcium carbonate-containing material, is at least one ground calcium carbonate (GCC).

20

“Dolomite” in the meaning of the present invention is a carbonatic calcium-magnesium-mineral having the chemical composition of $\text{CaMg}(\text{CO}_3)_2$ (“ $\text{CaCO}_3 \cdot \text{MgCO}_3$ ”). Dolomite mineral contains at least 30.0 wt.-% MgCO_3 , based on the total weight of dolomite, preferably more than 35.0 wt.-%, more preferably more than
25 40.0 wt.-% MgCO_3 .

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“Ground calcium carbonate” (GCC) in the meaning of the present invention is a calcium carbonate obtained from natural sources, such as limestone, marble, chalk or mixtures thereof.

5

It is appreciated that the crumbles comprising the at least one calcium carbonate-containing material are obtainable by the process for the preparation of crumbles as described further below.

- 10 For example, the GCC is selected from the group comprising marble, chalk, limestone and mixtures thereof. In one embodiment, the GCC is marble or chalk, preferably marble.

- 15 According to one embodiment of the present invention, the at least one calcium carbonate-containing material comprises, preferably consists of, particles consisting of calcium carbonate in an amount of ≥ 50.0 wt.-%, preferably of 90.0 wt.-%, more preferably of ≥ 95.0 wt.-% and most preferably of ≥ 97.0 wt.-%, based on the total dry weight of the at least one at least one calcium carbonate-containing material.

- 20 The term “dry” with regard to the at least one calcium carbonate-containing material is understood to be a material having less than 0.3 % by weight of water relative to the weight of the at least one calcium carbonate-containing material. The % water is determined according to the Coulometric Karl Fischer measurement method, wherein the at least one natural source of calcium carbonate is heated to 220°C, and the water
25 content released as vapour and isolated using a stream of nitrogen gas (at 100 ml/min) is determined in a Coulometric Karl Fischer unit.

- The at least one calcium carbonate-containing material preferably comprises, more preferably consists of, particles having a weight median particle size d_{50} of 0.5 to
30 2.0 μm , as measured by the sedimentation method.

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In one embodiment of the present invention, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a weight median particle size d_{50} preferably from 0.5 to 1.9 μm , more preferably from 0.6 to 1.8 μm , and most preferably from 0.7 to 1.8 μm , as measured by the sedimentation method.

Additionally, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a weight particle size d_{75} from 0.7 to 3.0 μm , as measured by the sedimentation method. In one embodiment of the present invention, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a weight particle size d_{75} from 0.7 to 2.9 μm , and most preferably from 0.7 to 2.8 μm , as measured by the sedimentation method.

Additionally, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a weight particle size d_{25} from 0.1 to 1.0 μm , as measured by the sedimentation method. In one embodiment of the present invention, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a weight particle size d_{25} from 0.1 to 0.9 μm , and most preferably from 0.15 to 0.8 μm , as measured by the sedimentation method.

It is thus one requirement of the instant invention that the particles of the at least one calcium carbonate-containing material in the crumbles have a i) weight particle size d_{75} of 0.7 to 3.0 μm , ii) weight median particle size d_{50} of 0.5 to 2.0 μm and iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method.

Preferably, the particles of the at least one calcium carbonate-containing material have a i) weight particle size d_{75} of 0.7 to 2.9 μm , ii) weight median particle size d_{50} of 0.5 to 1.9 μm and iii) weight particle size d_{25} of 0.1 to 0.9 μm , as measured according to the sedimentation method. More preferably, the particles of the at least

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one calcium carbonate-containing material have a i) weight particle size d_{75} of 0.7 to 2.8 μm , ii) weight median particle size d_{50} of 0.6 to 1.8 μm and iii) weight particle size d_{25} of 0.15 to 0.8 μm , as measured according to the sedimentation method.

- 5 Additionally or alternatively, the at least one calcium carbonate-containing material comprises, preferably consists of, particles of which at least 30.0 wt.-%, preferably at least 50.0 wt.-%, more preferably at least 58.0 wt.-% and most preferably from 58.0 to 95.0 wt.-%, have a weight particle size of $\leq 2.0 \mu\text{m}$, more preferably of $\leq 1.8 \mu\text{m}$, even more preferably of $\leq 1.5 \mu\text{m}$ and most preferably of $\leq 1.0 \mu\text{m}$, as measured
10 according to the sedimentation method.

- For example, the at least one calcium carbonate-containing material comprises, preferably consists of, particles of which at least 30.0 to 85.0 wt.-%, preferably from 50.0 to 85.0 wt.-% and most preferably from 58.0 to 85.0 wt.-%, have a weight
15 particle size of $\leq 1.0 \mu\text{m}$, as measured according to the sedimentation method.

- Additionally or alternatively, the at least one calcium carbonate-containing material comprises, preferably consists of, particles of which at least 50.0 to 95.0 wt.-%, preferably from 58.0 to 95.0 wt.-% and most preferably from 80.0 to 95.0 wt.-%,
20 have a weight particle size of $\leq 2.0 \mu\text{m}$, as measured according to the sedimentation method.

- The at least one calcium carbonate-containing material may comprise, preferably consist of, particles having a controlled low top cut, for example, of $\leq 9.5 \mu\text{m}$. The
25 term “top cut” (or top size), as used herein, means the particle size value wherein at least 98.0 wt.-% of the material particles are less than that size. Preferably, the at least one calcium carbonate-containing material comprises, preferably consists of, particles having a top cut of $\leq 8.0 \mu\text{m}$ and more preferably of $\leq 7.5 \mu\text{m}$.

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It is one requirement of the instant invention that the at least one calcium carbonate-containing material comprises particles having a low BET specific surface area. In particular, it is required that the at least one calcium carbonate-containing material comprises particles having a BET specific surface area of from 4.0 to 12.0 m²/g,

- 5 measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010) and is specified in m²/g. Preferably, the at least one calcium carbonate-containing material consists of particles having a BET specific surface area of from 4.0 to 12.0 m²/g, measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010).

- 10 In one embodiment at least one calcium carbonate-containing material comprises particles having a BET specific surface area of from 5.0 to 10.0 m²/g, measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010). Preferably, at least one calcium carbonate-containing material consists of particles having a BET specific surface area of from 5.0 to 10.0 m²/g, measured by nitrogen gas adsorption
- 15 using the BET isotherm (ISO 9277:2010).

It is appreciated that the crumbles may further comprise at least one further particulate filler material.

- 20 In one embodiment the crumbles consists of the at least one calcium carbonate-containing material, preferably dolomite and/or the at least one ground calcium carbonate (GCC), and optionally at least one further particulate filler material. For example, the crumbles consists of the at least one calcium carbonate-containing material, preferably dolomite and/or the at least one ground calcium carbonate
- 25 (GCC), and at least one further particulate filler material.

The term “at least one” further particulate filler material in the meaning of the present invention means that the further particulate filler material comprises, preferably consists of, one or more further particulate filler material.

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In one embodiment of the present invention, the at least one further particulate filler material comprises, preferably consists of, one further particulate filler material.

Alternatively, the at least one further particulate filler material comprises, preferably consists of, two or more further particulate filler materials. For example, the at least
5 one further particulate filler material comprises, preferably consists of, two or three further particulate filler materials.

Preferably, the at least one further particulate filler material comprises, more preferably consists of, one further particulate filler material.

10

In one embodiment the crumbles are free of the at least one further particulate filler material. That is to say, the particulate material of the crumbles preferably consists of the at least one calcium carbonate-containing material.

15 If the crumbles comprise at least one further particulate filler material, the at least one further particulate filler material is preferably selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-
hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or
20 kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof.

“Precipitated calcium carbonate” (PCC) in the meaning of the present invention is a synthesized material, generally obtained by precipitation following reaction of
25 carbon dioxide and lime in an aqueous environment or by precipitation of a calcium and carbonate ion source in water. PCC may be one or more of the aragonitic, vateritic and calcitic mineralogical crystal forms. Preferably, PCC is one of the aragonitic, vateritic and calcitic mineralogical crystal forms.

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Aragonite is commonly in the acicular form, whereas vaterite belongs to the hexagonal crystal system. Calcite can form scalenohedral, prismatic, spherulitic and rhombohedral forms. PCC can be produced in different ways, e.g. by precipitation with carbon dioxide, the lime soda process, or the Solvay process in which PCC is a by-product of ammonia production. The obtained PCC slurry can be mechanically dewatered and dried.

The crumbles may comprise at least one further particulate filler material, wherein the at least one further particulate filler material is preferably precipitated calcium carbonate (PCC).

The crumbles preferably contain the at least one calcium carbonate-containing material in an amount of at least 70.0 wt.-%, more preferably at least 80.0 wt.-% and most preferably at least 90.0 wt.-%, based on the total dry weight of the crumbles. For example, the crumbles may contain the at least one calcium carbonate-containing material in an amount from 70.0 to 100.0 wt.-%, more preferably from 80.0 to 100.0 wt.-% and most preferably from 90.0 to 100.0 wt.-% or from 90.0 to 99.7 wt.-%, based on the total dry weight of the crumbles.

The crumbles may contain the at least one further particulate filler material in an amount of at most 30.0 wt.-%, more preferably at most 20.0 wt.-% and most preferably at most 10.0 wt.-%, based on the total dry weight of the crumbles. For example, the crumbles may contain the at least one further particulate filler material in an amount from 0.0 to 30.0 wt.-%, more preferably from 0.0 to 20.0 wt.-% and most preferably from 0.0 to 10.0 wt.-% or from 0.2 to 10.0 wt.-%, based on the total dry weight of the crumbles.

However, it is appreciated that the crumbles may also contain the at least one further particulate filler material in an amount of more than 30.0 wt.-% such as e.g. in an amount of 50.0 wt.-% or 75.0 wt.-%, based on the total dry weight of the crumbles, but in

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order to obtain crumbles having more favourable properties, it is preferred that the crumbles contain the at least one further particulate filler material in an amount of at most 30.0 wt.-%, more preferably at most 20.0 wt.-% and most preferably at most 10.0 wt.-%, based on the total dry weight of the crumbles.

5

In one embodiment the crumbles consists of 70.0 to 100.0 wt.-%, based on the total dry weight of the crumbles, of the at least one calcium carbonate-containing material, and of 0.0 to 30.0 wt.-%, based on the total dry weight of the crumbles, of the at least one further particulate filler material, preferably of 80.0 to 100.0 wt.-%, based on the
10 total dry weight of the crumbles, of the at least one calcium carbonate-containing material, and of 0.0 to 20.0 wt.-%, based on the total dry weight of the crumbles, of the at least one further particulate filler material and more preferably of 90.0 to 100.0 wt.-%, based on the total dry weight of the crumbles, of the at least one calcium carbonate-containing material, and of 0.0 to 10.0 wt.-%, based on the total
15 dry weight of the crumbles, of the at least one further particulate filler material.

Alternatively, the crumbles consists of 90.0 to 99.8 wt.-%, based on the total dry weight of the crumbles, of the at least one calcium carbonate-containing material, and of 0.2 to 10.0 wt.-%, based on the total dry weight of the crumbles, of the at least
20 one further particulate filler material.

Preferably, the crumbles consist of the at least one natural calcium carbonate-containing material, more preferably dolomite and/or the at least one ground calcium carbonate (GCC). For example, the crumbles consists of the at least one ground
25 calcium carbonate (GCC). In one embodiment of the present invention, the at least one ground calcium carbonate (GCC) is selected from the group comprising marble, chalk, limestone and mixtures thereof.

It is one requirement of the present invention that the crumbles have specific solids
30 content in order to avoid the disadvantages of slurries, i.e. the use of biocides and/or

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dispersants, high weight and volume for transportation, and powders, i.e. low bulk density and flow properties at high dusting. Thus, it is required that the crumbles have solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles. Preferably, the crumbles have solids content of 80.0 wt.-% to 88.0 wt.-%, based on the total weight of the crumbles.

It is appreciated that the above solids content refers to crumbles obtained right after the process described below. It is thus appreciated that the crumbles may have higher solids content, such as of up to 98.0 wt.-%, based on the total weight of the crumbles, if they are stored at room temperature.

It is appreciated that the crumbles have specifically low moisture pick-up susceptibility.

The “moisture pick-up susceptibility” of a material refers to the amount of moisture absorbed on the surface of said material within a certain time upon exposure to a defined humid atmosphere and is expressed in mg/g.

It is preferred that the crumbles have a moisture pick up susceptibility such that its total surface moisture level is ≤ 0.6 mg/g, preferably ≤ 0.5 mg/g, more preferably ≤ 0.4 mg/g and most preferably ≤ 0.3 mg/g of the dry crumbles after exposure to an atmosphere of 50% of relative humidity for 48 hours at a temperature of 23°C.

Additionally or alternatively, the crumbles have moisture content of from 0.2 wt.-% to 0.6 wt.-%, preferably from 0.2 wt.-% to 0.4 wt.-% and most preferably from 0.25 wt.-% to 0.35 wt.-% based on the total dry weight of the crumbles.

In one embodiment of the present invention, the crumbles comprise on at least a part of the particle's accessible surface area a treatment layer comprising a hydrophobizing agent.

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The term "accessible" surface area of a material refers to the part of the material surface which is in contact with a liquid phase of an aqueous solution, suspension, dispersion or reactive molecules such as a hydrophobizing agent.

- 5 In one embodiment, the hydrophobizing agent is an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or reaction products thereof. Accordingly, at least a part of the accessible surface area of the calcium carbonate-containing material particles is covered by a treatment layer comprising an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or
10 reaction products thereof.

- The term "reaction products" of the aliphatic carboxylic acid in the meaning of the present invention refers to products obtained by contacting the at least one calcium carbonate-containing material with the at least one aliphatic carboxylic acid. Said
15 reaction products are formed between at least a part of the applied at least one aliphatic carboxylic acid and reactive molecules located at the surface of the calcium carbonate-containing material particles.

- The aliphatic carboxylic acid in the meaning of the present invention may be selected
20 from one or more straight chain, branched chain, saturated, unsaturated and/or alicyclic carboxylic acids. Preferably, the aliphatic carboxylic acid is a monocarboxylic acid, i.e. the aliphatic carboxylic acid is characterized in that a single carboxyl group is present. Said carboxyl group is placed at the end of the carbon skeleton.

- 25 In one embodiment of the present invention, the aliphatic carboxylic acid is selected from saturated unbranched carboxylic acids, that is to say the aliphatic carboxylic acid is preferably selected from the group of carboxylic acids consisting of pentanoic acid, hexanoic acid, heptanoic acid, octanoic acid, nonanoic acid, decanoic acid,
30 undecanoic acid, lauric acid, tridecanoic acid, myristic acid, pentadecanoic acid,

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palmitic acid, heptadecanoic acid, stearic acid, nonadecanoic acid, arachidic acid, heneicosylic acid, behenic acid, tricosylic acid, lignoceric acid and mixtures thereof.

In another embodiment of the present invention, the aliphatic carboxylic acid is
5 selected from the group consisting of octanoic acid, decanoic acid, lauric acid, myristic acid, palmitic acid, stearic acid, arachidic acid and mixtures thereof. Preferably, the aliphatic carboxylic acid is selected from the group consisting of myristic acid, palmitic acid, stearic acid and mixtures thereof.

10 For example, the aliphatic carboxylic acid is stearic acid.

Additionally or alternatively, the hydrophobizing agent can be at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a
15 total amount of carbon atoms from C2 to C30 in the substituent. Accordingly, at least a part of the accessible surface area of the calcium carbonate-containing material particles is covered by a treatment layer comprising at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of
20 carbon atoms from C2 to C30 in the substituent and/or reaction products thereof.

The term "reaction products" of the mono-substituted succinic anhydride in the meaning of the present invention refers to products obtained by contacting the at least one calcium carbonate-containing material with the at least one mono-substituted succinic anhydride. Said reaction products are formed between at least a
25 part of the applied at least one mono-substituted succinic anhydride and reactive molecules located at the surface of the calcium carbonate-containing material particles.

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For example, the at least one mono-substituted succinic anhydride consists of succinic anhydride mono-substituted with one group being a linear alkyl group having a total amount of carbon atoms from C2 to C30, preferably from C3 to C20 and most preferably from C4 to C18 in the substituent or a branched alkyl group
5 having a total amount of carbon atoms from C3 to C30, preferably from C3 to C20 and most preferably from C4 to C18 in the substituent.

For example, the at least one mono-substituted succinic anhydride consists of succinic anhydride mono-substituted with one group being a linear alkyl group
10 having a total amount of carbon atoms from C2 to C30, preferably from C3 to C20 and most preferably from C4 to C18 in the substituent. Additionally or alternatively, the at least one mono-substituted succinic anhydride consists of succinic anhydride mono-substituted with one group being a branched alkyl group having a total amount of carbon atoms from C3 to C30, preferably from C3 to C20 and most preferably
15 from C4 to C18 in the substituent.

The term "alkyl" in the meaning of the present invention refers to a linear or branched, saturated organic compound composed of carbon and hydrogen. In other words, "alkyl mono-substituted succinic anhydrides" are composed of linear or
20 branched, saturated hydrocarbon chains containing a pendant succinic anhydride group.

In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is at least one linear or branched alkyl mono-substituted succinic
25 anhydride. For example, the at least one alkyl mono-substituted succinic anhydride is selected from the group comprising ethylsuccinic anhydride, propylsuccinic anhydride, butylsuccinic anhydride, triisobutyl succinic anhydride, pentylsuccinic anhydride, hexylsuccinic anhydride, heptylsuccinic anhydride, octylsuccinic anhydride, nonylsuccinic anhydride, decyl succinic anhydride, dodecyl succinic

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anhydride, hexadecanoyl succinic anhydride, octadecanoyl succinic anhydride, and mixtures thereof.

- It is appreciated that e.g. the term "butylsuccinic anhydride" comprises linear and branched butylsuccinic anhydride(s). One specific example of linear butylsuccinic anhydride(s) is n-butylsuccinic anhydride. Specific examples of branched butylsuccinic anhydride(s) are iso-butylsuccinic anhydride, sec-butylsuccinic anhydride and/or tert-butylsuccinic anhydride.
- Furthermore, it is appreciated that e.g. the term "hexadecanoyl succinic anhydride" comprises linear and branched hexadecanoyl succinic anhydride(s). One specific example of linear hexadecanoyl succinic anhydride(s) is n-hexadecanoyl succinic anhydride. Specific examples of branched hexadecanoyl succinic anhydride(s) are 14-methylpentadecanoyl succinic anhydride, 13-methylpentadecanoyl succinic anhydride, 12-methylpentadecanoyl succinic anhydride, 11-methylpentadecanoyl succinic anhydride, 10-methylpentadecanoyl succinic anhydride, 9-methylpentadecanoyl succinic anhydride, 8-methylpentadecanoyl succinic anhydride, 7-methylpentadecanoyl succinic anhydride, 6-methylpentadecanoyl succinic anhydride, 5-methylpentadecanoyl succinic anhydride, 4-methylpentadecanoyl succinic anhydride, 3-methylpentadecanoyl succinic anhydride, 2-methylpentadecanoyl succinic anhydride, 1-methylpentadecanoyl succinic anhydride, 13-ethylbutadecanoyl succinic anhydride, 12-ethylbutadecanoyl succinic anhydride, 11-ethylbutadecanoyl succinic anhydride, 10-ethylbutadecanoyl succinic anhydride, 9-ethylbutadecanoyl succinic anhydride, 8-ethylbutadecanoyl succinic anhydride, 7-ethylbutadecanoyl succinic anhydride, 6-ethylbutadecanoyl succinic anhydride, 5-ethylbutadecanoyl succinic anhydride, 4-ethylbutadecanoyl succinic anhydride, 3-ethylbutadecanoyl succinic anhydride, 2-ethylbutadecanoyl succinic anhydride, 1-ethylbutadecanoyl succinic anhydride, 2-butyldecadecanoyl succinic anhydride, 1-hexyldecadecanoyl succinic anhydride, 1-hexyl-2-decanoyl succinic anhydride, 2-hexyldecadecanoyl succinic anhydride, 6,12-dimethylbutadecanoyl succinic anhydride, 2,2-diethyldodecanoyl succinic

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anhydride, 4,8,12-trimethyltridecanyl succinic anhydride, 2,2,4,6,8-pentamethylundecanyl succinic anhydride, 2-ethyl-4-methyl-2-(2-methylpentyl)-heptyl succinic anhydride and/or 2-ethyl-4,6-dimethyl-2-propylnonyl succinic anhydride.

5

Furthermore, it is appreciated that e.g. the term "octadecanyl succinic anhydride" comprises linear and branched octadecanyl succinic anhydride(s). One specific example of linear octadecanyl succinic anhydride(s) is n-octadecanyl succinic anhydride. Specific examples of branched hexadecanyl succinic anhydride(s) are

- 10 16-methylheptadecanyl succinic anhydride, 15-methylheptadecanyl succinic anhydride, 14-methylheptadecanyl succinic anhydride, 13-methylheptadecanyl succinic anhydride, 12-methylheptadecanyl succinic anhydride, 11-methylheptadecanyl succinic anhydride, 10-methylheptadecanyl succinic anhydride, 9-methylheptadecanyl succinic anhydride, 8-methylheptadecanyl succinic anhydride, 7-methylheptadecanyl succinic anhydride, 6-methylheptadecanyl succinic anhydride, 5-methylheptadecanyl succinic anhydride, 4-methylheptadecanyl succinic anhydride, 3-methylheptadecanyl succinic anhydride, 2-methylheptadecanyl succinic anhydride, 1-methylheptadecanyl succinic anhydride, 14-ethylhexadecanyl succinic anhydride, 13-ethylhexadecanyl succinic anhydride, 12-ethylhexadecanyl succinic anhydride, 11-ethylhexadecanyl succinic anhydride, 10-ethylhexadecanyl succinic anhydride, 9-ethylhexadecanyl succinic anhydride, 8-ethylhexadecanyl succinic anhydride, 7-ethylhexadecanyl succinic anhydride, 6-ethylhexadecanyl succinic anhydride, 5-ethylhexadecanyl succinic anhydride, 4-ethylhexadecanyl succinic anhydride, 3-ethylhexadecanyl succinic anhydride, 2-ethylhexadecanyl succinic anhydride, 1-ethylhexadecanyl succinic anhydride, 2-hexyldodecanyl succinic anhydride, 2-heptylundecanyl succinic anhydride, iso-octadecanyl succinic anhydride and/or 1-octyl-2-decanyl succinic anhydride.

- 25 In one embodiment of the present invention, the at least one alkyl mono-substituted succinic anhydride is selected from the group comprising butylsuccinic anhydride,
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hexylsuccinic anhydride, heptylsuccinic anhydride, octylsuccinic anhydride, hexadecanyl succinic anhydride, octadecanyl succinic anhydride, and mixtures thereof.

5 In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is one kind of alkyl mono-substituted succinic anhydride. For example, the one alkyl mono-substituted succinic anhydride is butylsuccinic anhydride. Alternatively, the one alkyl mono-substituted succinic anhydride is hexylsuccinic anhydride. Alternatively, the one alkyl mono-substituted succinic
10 anhydride is heptylsuccinic anhydride or octylsuccinic anhydride. Alternatively, the one alkyl mono-substituted succinic anhydride is hexadecanyl succinic anhydride. For example, the one alkyl mono-substituted succinic anhydride is linear hexadecanyl succinic anhydride such as n-hexadecanyl succinic anhydride or branched hexadecanyl succinic anhydride such as 1-hexyl-2-decanyl succinic
15 anhydride. Alternatively, the one alkyl mono-substituted succinic anhydride is octadecanyl succinic anhydride. For example, the one alkyl mono-substituted succinic anhydride is linear octadecanyl succinic anhydride such as n-octadecanyl succinic anhydride or branched octadecanyl succinic anhydride such as iso-octadecanyl succinic anhydride or 1-octyl-2-decanyl succinic anhydride.

20

In one embodiment of the present invention, the one alkyl mono-substituted succinic anhydride is butylsuccinic anhydride such as n-butylsuccinic anhydride.

In one embodiment of the present invention, the at least one mono-substituted
25 succinic anhydride is a mixture of two or more kinds of alkyl mono-substituted succinic anhydrides. For example, the at least one mono-substituted succinic anhydride is a mixture of two or three kinds of alkyl mono-substituted succinic anhydrides.

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In one embodiment of the present invention, the at least one mono-substituted succinic anhydride consists of succinic anhydride mono-substituted with one group being a linear alkenyl group having a total amount of carbon atoms from C2 to C30, preferably from C3 to C20 and most preferably from C4 to C18 in the substituent or
5 a branched alkenyl group having a total amount of carbon atoms from C3 to C30, preferably from C4 to C20 and most preferably from C4 to C18 in the substituent.

The term "alkenyl" in the meaning of the present invention refers to a linear or branched, unsaturated organic compound composed of carbon and hydrogen. Said
10 organic compound further contains at least one double bond in the substituent, preferably one double bond. In other words, "alkenyl mono-substituted succinic anhydrides" are composed of linear or branched, unsaturated hydrocarbon chains containing a pendant succinic anhydride group. It is appreciated that the term "alkenyl" in the meaning of the present invention includes the cis and trans isomers.
15

In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is at least one linear or branched alkenyl mono-substituted succinic anhydride. For example, the at least one alkenyl mono-substituted succinic anhydride is selected from the group comprising ethenylsuccinic anhydride,
20 propenylsuccinic anhydride, butenylsuccinic anhydride, triisobutenyl succinic anhydride, pentenylsuccinic anhydride, hexenylsuccinic anhydride, heptenylsuccinic anhydride, octenylsuccinic anhydride, nonenylsuccinic anhydride, decenyl succinic anhydride, dodecenyl succinic anhydride, hexadecenyl succinic anhydride, octadecenyl succinic anhydride, and mixtures thereof.

25 Accordingly, it is appreciated that e.g. the term "hexadecenyl succinic anhydride" comprises linear and branched hexadecenyl succinic anhydride(s). One specific example of linear hexadecenyl succinic anhydride(s) is n-hexadecenyl succinic anhydride such as 14-hexadecenyl succinic anhydride, 13-hexadecenyl succinic
30 anhydride, 12-hexadecenyl succinic anhydride, 11-hexadecenyl succinic anhydride,

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10-hexadecenyl succinic anhydride, 9-hexadecenyl succinic anhydride, 8-hexadecenyl succinic anhydride, 7-hexadecenyl succinic anhydride, 6-hexadecenyl succinic anhydride, 5-hexadecenyl succinic anhydride, 4-hexadecenyl succinic anhydride, 3-hexadecenyl succinic anhydride and/or 2-hexadecenyl succinic anhydride. Specific examples of branched hexadecenyl succinic anhydride(s) are 14-methyl-9-pentadecenyl succinic anhydride, 14-methyl-2-pentadecenyl succinic anhydride, 1-hexyl-2-decenyl succinic anhydride and/or iso-hexadecenyl succinic anhydride.

Furthermore, it is appreciated that e.g. the term "octadecenyl succinic anhydride" comprises linear and branched octadecenyl succinic anhydride(s). One specific example of linear octadecenyl succinic anhydride(s) is n-octadecenyl succinic anhydride such as 16-octadecenyl succinic anhydride, 15-octadecenyl succinic anhydride, 14-octadecenyl succinic anhydride, 13-octadecenyl succinic anhydride, 12-octadecenyl succinic anhydride, 11-octadecenyl succinic anhydride, 10-octadecenyl succinic anhydride, 9-octadecenyl succinic anhydride, 8-octadecenyl succinic anhydride, 7-octadecenyl succinic anhydride, 6-octadecenyl succinic anhydride, 5-octadecenyl succinic anhydride, 4-octadecenyl succinic anhydride, 3-octadecenyl succinic anhydride and/or 2-octadecenyl succinic anhydride. Specific examples of branched octadecenyl succinic anhydride(s) are 16-methyl-9-heptadecenyl succinic anhydride, 16-methyl-7-heptadecenyl succinic anhydride, 1-octyl-2-decenyl succinic anhydride and/or iso-octadecenyl succinic anhydride.

In one embodiment of the present invention, the at least one alkenyl mono-substituted succinic anhydride is selected from the group comprising hexenylsuccinic anhydride, octenylsuccinic anhydride, hexadecenyl succinic anhydride, octadecenyl succinic anhydride, and mixtures thereof.

In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is one alkenyl mono-substituted succinic anhydride. For example,

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the one alkenyl mono-substituted succinic anhydride is hexenylsuccinic anhydride. Alternatively, the one alkenyl mono-substituted succinic anhydride is octenylsuccinic anhydride. Alternatively, the one alkenyl mono-substituted succinic anhydride is hexadecenyl succinic anhydride. For example, the one alkenyl mono-substituted succinic anhydride is linear hexadecenyl succinic anhydride such as n-hexadecenyl succinic anhydride or branched hexadecenyl succinic anhydride such as 1-hexyl-2-decenyl succinic anhydride. Alternatively, the one alkenyl mono-substituted succinic anhydride is octadecenyl succinic anhydride. For example, the one alkyl mono-substituted succinic anhydride is linear octadecenyl succinic anhydride such as n-octadecenyl succinic anhydride or branched octadecenyl succinic anhydride such as iso-octadecenyl succinic anhydride, or 1-octyl-2-decenyl succinic anhydride.

In one embodiment of the present invention, the one alkenyl mono-substituted succinic anhydride is linear octadecenyl succinic anhydride such as n-octadecenyl succinic anhydride. In another embodiment of the present invention, the one alkenyl mono-substituted succinic anhydride is linear octenylsuccinic anhydride such as n-octenylsuccinic anhydride.

If the at least one mono-substituted succinic anhydride is one alkenyl mono-substituted succinic anhydride, it is appreciated that the one alkenyl mono-substituted succinic anhydride is present in an amount of ≥ 95 wt.-% and preferably of ≥ 96.5 -wt.-%, based on the total weight of the at least one mono-substituted succinic anhydride.

In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is a mixture of two or more kinds of alkenyl mono-substituted succinic anhydrides. For example, the at least one mono-substituted succinic anhydride is a mixture of two or three kinds of alkenyl mono-substituted succinic anhydrides.

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In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is a mixture of two or more kinds of alkenyl mono-substituted succinic anhydrides comprising linear hexadecenyl succinic anhydride(s) and linear octadecenyl succinic anhydride(s). Alternatively, the at least one mono-substituted succinic anhydride is a mixture of two or more kinds of alkenyl mono-substituted succinic anhydrides comprising branched hexadecenyl succinic anhydride(s) and branched octadecenyl succinic anhydride(s). For example, the one or more hexadecenyl succinic anhydride is linear hexadecenyl succinic anhydride like n-hexadecenyl succinic anhydride and/or branched hexadecenyl succinic anhydride like 1-hexyl-2-decenyl succinic anhydride. Additionally or alternatively, the one or more octadecenyl succinic anhydride is linear octadecenyl succinic anhydride like n-octadecenyl succinic anhydride and/or branched octadecenyl succinic anhydride like iso-octadecenyl succinic anhydride and/or 1-octyl-2-decenyl succinic anhydride.

It is also appreciated that the at least one mono-substituted succinic anhydride may be a mixture of at least one alkyl mono-substituted succinic anhydrides and at least one alkenyl mono-substituted succinic anhydrides.

If the at least one mono-substituted succinic anhydride is a mixture of at least one alkyl mono-substituted succinic anhydrides and at least one alkenyl mono-substituted succinic anhydrides, it is appreciated that the alkyl substituent of the of at least one alkyl mono-substituted succinic anhydrides and the alkenyl substituent of the of at least one alkenyl mono-substituted succinic anhydrides are preferably the same. For example, the at least one mono-substituted succinic anhydride is a mixture of ethylsuccinic anhydride and ethenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of propylsuccinic anhydride and propenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of butylsuccinic anhydride and butenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of triisobutyl succinic anhydride and triisobutenyl succinic anhydride. Alternatively, the

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at least one mono-substituted succinic anhydride is a mixture of pentylsuccinic anhydride and pentenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of hexylsuccinic anhydride and hexenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of heptylsuccinic anhydride and heptenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of octylsuccinic anhydride and octenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of nonylsuccinic anhydride and nonenylsuccinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of decyl succinic anhydride and decenyl succinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of dodecyl succinic anhydride and dodecenyl succinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of hexadecanyl succinic anhydride and hexadecenyl succinic anhydride. For example, the at least one mono-substituted succinic anhydride is a mixture of linear hexadecanyl succinic anhydride and linear hexadecenyl succinic anhydride or a mixture of branched hexadecanyl succinic anhydride and branched hexadecenyl succinic anhydride. Alternatively, the at least one mono-substituted succinic anhydride is a mixture of octadecanyl succinic anhydride and octadecenyl succinic anhydride. For example, the at least one mono-substituted succinic anhydride is a mixture of linear octadecanyl succinic anhydride and linear octadecenyl succinic anhydride or a mixture of branched octadecanyl succinic anhydride and branched octadecenyl succinic anhydride.

In one embodiment of the present invention, the at least one mono-substituted succinic anhydride is a mixture of nonylsuccinic anhydride and nonenylsuccinic anhydride.

If the at least one mono-substituted succinic anhydride is a mixture of at least one alkyl mono-substituted succinic anhydrides and at least one alkenyl mono-substituted succinic anhydrides, the weight ratio between the at least one alkyl mono-substituted

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succinic anhydride and the at least one alkenyl mono-substituted succinic anhydride is between 90:10 and 10:90 (wt.-%/wt.-%). For example, the weight ratio between the at least one alkyl mono-substituted succinic anhydride and the at least one alkenyl mono-substituted succinic anhydride is between 70:30 and 30:70
5 (wt.-%/wt.-%) or between 60:40 and 40:60.

Additionally or alternatively, the hydrophobizing agent may be a phosphoric acid ester blend. Accordingly, at least a part of the accessible surface area of the calcium carbonate-containing material particles is covered by a treatment layer comprising a
10 phosphoric acid ester blend of one or more phosphoric acid mono-ester and/or reaction products thereof and one or more phosphoric acid di-ester and/or reaction products thereof.

The term "reaction products" of the phosphoric acid mono-ester and one or more
15 phosphoric acid di-ester in the meaning of the present invention refers to products obtained by contacting the at least one calcium carbonate-containing material with the at least one phosphoric acid ester blend. Said reaction products are formed between at least a part of the applied phosphoric acid ester blend and reactive molecules located at the surface of the calcium carbonate-containing material
20 particles.

The term "phosphoric acid mono-ester" in the meaning of the present invention refers to an o-phosphoric acid molecule mono-esterified with one alcohol molecule selected from unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols
25 having a total amount of carbon atoms from C6 to C30, preferably from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent.

The term "phosphoric acid di-ester" in the meaning of the present invention refers to
30 an o-phosphoric acid molecule di-esterified with two alcohol molecules selected

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from the same or different, unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols having a total amount of carbon atoms from C6 to C30, preferably from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent.

5

It is appreciated that the expression "one or more" phosphoric acid mono-ester means that one or more kinds of phosphoric acid mono-ester may be present in the phosphoric acid ester blend.

- 10 Accordingly, it should be noted that the one or more phosphoric acid mono-ester may be one kind of phosphoric acid mono-ester. Alternatively, the one or more phosphoric acid mono-ester may be a mixture of two or more kinds of phosphoric acid mono-ester. For example, the one or more phosphoric acid mono-ester may be a mixture of two or three kinds of phosphoric acid mono-ester, like two kinds of
- 15 phosphoric acid mono-ester.

- In one embodiment of the present invention, the one or more phosphoric acid mono-ester consists of an o-phosphoric acid molecule esterified with one alcohol selected from unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols
- 20 having a total amount of carbon atoms from C6 to C30 in the alcohol substituent. For example, the one or more phosphoric acid mono-ester consists of an o-phosphoric acid molecule esterified with one alcohol selected from unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols having a total amount of carbon atoms from C8 to C22, more preferably from C8 to C20 and most preferably from
- 25 C8 to C18 in the alcohol substituent.

- In one embodiment of the present invention, the one or more phosphoric acid mono-ester is selected from the group comprising hexyl phosphoric acid mono-ester, heptyl phosphoric acid mono-ester, octyl phosphoric acid mono-ester, 2-ethylhexyl
- 30 phosphoric acid mono-ester, nonyl phosphoric acid mono-ester, decyl phosphoric

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acid mono-ester, undecyl phosphoric acid mono-ester, dodecyl phosphoric acid mono-ester, tetradecyl phosphoric acid mono-ester, hexadecyl phosphoric acid mono-ester, heptylnonyl phosphoric acid mono-ester, octadecyl phosphoric acid mono-ester, 2-octyl-1-decylphosphoric acid mono-ester, 2-octyl-1-
5 dodecylphosphoric acid mono-ester and mixtures thereof.

For example, the one or more phosphoric acid mono-ester is selected from the group comprising 2-ethylhexyl phosphoric acid mono-ester, hexadecyl phosphoric acid mono-ester, heptylnonyl phosphoric acid mono-ester, octadecyl phosphoric acid
10 mono-ester, 2-octyl-1-decylphosphoric acid mono-ester, 2-octyl-1-dodecylphosphoric acid mono-ester and mixtures thereof. In one embodiment of the present invention, the one or more phosphoric acid mono-ester is 2-octyl-1-dodecylphosphoric acid mono-ester.

15 It is appreciated that the expression "one or more" phosphoric acid di-ester means that one or more kinds of phosphoric acid di-ester may be present in the coating layer of the at least one calcium carbonate-containing material and/or the phosphoric acid ester blend.

20 Accordingly, it should be noted that the one or more phosphoric acid di-ester may be one kind of phosphoric acid di-ester. Alternatively, the one or more phosphoric acid di-ester may be a mixture of two or more kinds of phosphoric acid di-ester. For example, the one or more phosphoric acid di-ester may be a mixture of two or three kinds of phosphoric acid di-ester, like two kinds of phosphoric acid di-ester.

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In one embodiment of the present invention, the one or more phosphoric acid di-ester consists of an o-phosphoric acid molecule esterified with two alcohols selected from unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols having a total amount of carbon atoms from C6 to C30 in the alcohol substituent. For
30 example, the one or more phosphoric acid di-ester consists of an o-phosphoric acid

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molecule esterified with two fatty alcohols selected from unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols having a total amount of carbon atoms from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent.

5

It is appreciated that the two alcohols used for esterifying the phosphoric acid may be independently selected from the same or different, unsaturated or saturated, branched or linear, aliphatic or aromatic alcohols having a total amount of carbon atoms from C6 to C30 in the alcohol substituent. In other words, the one or more phosphoric acid di-ester may comprise two substituents being derived from the same alcohols or the phosphoric acid di-ester molecule may comprise two substituents being derived from different alcohols.

10

In one embodiment of the present invention, the one or more phosphoric acid di-ester consists of an o-phosphoric acid molecule esterified with two alcohols selected from the same or different, saturated and linear and aliphatic alcohols having a total amount of carbon atoms from C6 to C30, preferably from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent. Alternatively, the one or more phosphoric acid di-ester consists of an o-phosphoric acid molecule esterified with two alcohols selected from the same or different, saturated and branched and aliphatic alcohols having a total amount of carbon atoms from C6 to C30, preferably from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent.

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In one embodiment of the present invention, the one or more phosphoric acid di-ester is selected from the group comprising hexyl phosphoric acid di-ester, heptyl phosphoric acid di-ester, octyl phosphoric acid di-ester, 2-ethylhexyl phosphoric acid di-ester, nonyl phosphoric acid di-ester, decyl phosphoric acid di-ester, undecyl phosphoric acid di-ester, dodecyl phosphoric acid di-ester, tetradecyl phosphoric acid di-ester, hexadecyl phosphoric acid di-ester, heptylnonyl phosphoric acid di-ester,

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octadecyl phosphoric acid di-ester, 2-octyl-1-decylphosphoric acid di-ester, 2-octyl-1-dodecylphosphoric acid di-ester and mixtures thereof.

For example, the one or more phosphoric acid di-ester is selected from the group
5 comprising 2-ethylhexyl phosphoric acid di-ester, hexadecyl phosphoric acid di-ester, heptylnonyl phosphoric acid di-ester, octadecyl phosphoric acid di-ester, 2-octyl-1-decylphosphoric acid di-ester, 2-octyl-1-dodecylphosphoric acid di-ester and mixtures thereof. In one embodiment of the present invention, the one or more phosphoric acid di-ester is 2-octyl-1-dodecylphosphoric acid di-ester.

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In one embodiment of the present invention, the one or more phosphoric acid mono-ester is selected from the group comprising 2-ethylhexyl phosphoric acid mono-ester, hexadecyl phosphoric acid mono-ester, heptylnonyl phosphoric acid mono-ester, octadecyl phosphoric acid mono-ester, 2-octyl-1-decylphosphoric acid mono-ester,
15 2-octyl-1-dodecylphosphoric acid mono-ester and mixtures thereof and the one or more phosphoric acid di-ester is selected from the group comprising 2-ethylhexyl phosphoric acid di-ester, hexadecyl phosphoric acid di-ester, heptylnonyl phosphoric acid di-ester, octadecyl phosphoric acid di-ester, 2-octyl-1-decylphosphoric acid di-ester, 2-octyl-1-dodecylphosphoric acid di-ester and mixtures thereof.

20

For example, at least a part of the accessible surface area of the at least one calcium carbonate-containing material comprises a phosphoric acid ester blend of one phosphoric acid mono-ester and/or reaction products thereof and one phosphoric acid di-ester and/or reaction products thereof. In this case, the one phosphoric acid mono-
25 ester is selected from the group comprising 2-ethylhexyl phosphoric acid mono-ester, hexadecyl phosphoric acid mono-ester, heptylnonyl phosphoric acid mono-ester, octadecyl phosphoric acid mono-ester, 2-octyl-1-decylphosphoric acid mono-ester and 2-octyl-1-dodecylphosphoric acid mono-ester, the one phosphoric acid di-ester is selected from the group comprising 2-ethylhexyl phosphoric acid di-ester, hexadecyl
30 phosphoric acid di-ester, heptylnonyl phosphoric acid di-ester, octadecyl phosphoric

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acid di-ester, 2-octyl-1-decylphosphoric acid di-ester and 2-octyl-1-dodecylphosphoric acid di-ester.

The phosphoric acid ester blend comprises the one or more phosphoric acid mono-
5 ester and/or reaction products thereof to the one or more phosphoric acid di-ester
and/or reaction products thereof in a specific molar ratio. In particular, the molar
ratio of the one or more phosphoric acid mono-ester and/or reaction products thereof
to the one or more phosphoric acid di-ester and/or reaction products thereof in the
treatment layer and/or the phosphoric acid ester blend is from 1:1 to 1:100,
10 preferably from 1 : 1.1 to 1 : 60, more preferably from 1 : 1.1 to 1 : 40, even more
preferably from 1 : 1.1 to 1 : 20 and most preferably from 1 : 1.1 to 1 : 10.

The wording "molar ratio of the one or more phosphoric acid mono-ester and
reaction products thereof to the one or more phosphoric acid di-ester and reaction
15 products thereof" in the meaning of the present invention refers to the sum of the
molecular weight of the phosphoric acid mono-ester molecules and/or the sum of the
molecular weight of the phosphoric acid mono-ester molecules in the reaction
products thereof to the sum of the molecular weight of the phosphoric acid di-ester
molecules and/or the sum of the molecular weight of the phosphoric acid di-ester
20 molecules in the reaction products thereof.

In one embodiment of the present invention, the phosphoric acid ester blend coated
on at least a part of the surface of the at least one calcium carbonate-containing
material may further comprise one or more phosphoric acid tri-ester and/or
25 phosphoric acid and/or reaction products thereof.

The term "phosphoric acid tri-ester" in the meaning of the present invention refers to
an o-phosphoric acid molecule tri-esterified with three alcohol molecules selected
from the same or different, unsaturated or saturated, branched or linear, aliphatic or
30 aromatic alcohols having a total amount of carbon atoms from C6 to C30, preferably

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from C8 to C22, more preferably from C8 to C20 and most preferably from C8 to C18 in the alcohol substituent.

It is appreciated that the expression "one or more" phosphoric acid tri-ester means
5 that one or more kinds of phosphoric acid tri-ester may be present on at least a part of the accessible surface area of the at least one calcium carbonate-containing material.

Accordingly, it should be noted that the one or more phosphoric acid tri-ester may be one kind of phosphoric acid tri-ester. Alternatively, the one or more phosphoric acid
10 tri-ester may be a mixture of two or more kinds of phosphoric acid tri-ester. For example, the one or more phosphoric acid tri-ester may be a mixture of two or three kinds of phosphoric acid tri-ester, like two kinds of phosphoric acid tri-ester.

It is preferred that at least a part of the accessible surface area of the at least one
15 calcium carbonate-containing material particles comprises a treatment layer comprising stearic acid and/or reaction products thereof.

If the crumbles comprise at least one further particulate filler material, the at least one further particulate filler material may comprise on at least a part of the accessible
20 surface area of filler material a treatment layer comprising a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or reaction products thereof and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of
25 carbon atoms from C2 to C30 in the substituent and/or reaction products thereof and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and/or reaction products thereof and one or more phosphoric acid di-ester and/or reaction products thereof.

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With regard to the definition of the hydrophobizing agent for the at least one further particulate filler material and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the hydrophobizing agent used for the calcium carbonate-containing material particles of the crumbles of the present invention.

If the calcium carbonate-containing material particles of the crumbles and the at least one further particulate filler material comprise on at least a part of the accessible surface area a treatment layer comprising a hydrophobizing agent, the hydrophobizing agent is preferably the same.

It is appreciated that the crumbles comprising the at least one calcium carbonate-containing material provide exceptional optical characteristics. In particular, it is appreciated that the crumbles comprising at least one calcium carbonate-containing material have a degree of whiteness R457, measured in accordance with the ISO 2469 Standard, of at least 85.0 %, more preferably of at least 87.0 %, even more preferably of at least 89.0 % and most preferably of at least 91.0 %. For example, the crumbles comprising the at least one calcium carbonate-containing material have a degree of whiteness R457, measured in accordance with the ISO 2469 Standard, of from 85.0 to 99.0 %, preferably from 87.0 to 99.0 %, more preferably from 89.0 to 99.0 % and most preferably from 91.0 % to 99.0 %. Most preferably, the crumbles comprising the at least one calcium carbonate-containing material have a degree of whiteness R457, measured in accordance with the ISO 2469 Standard, of at least 93.0 %, e.g. from 93.0 to 99.0 %.

Additionally or alternatively, the crumbles comprising the at least one calcium carbonate-containing material have a Yellowness Index according to DIN 6167 of less than 3.0, preferably of less than 2.5, more preferably of less than 2.0 and most preferably of less than 1.5.

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It is appreciated that the crumbles comprising the at least one calcium carbonate-containing material may be further suspended in an aqueous medium. That is to say, the crumbles comprising the at least one calcium carbonate-containing material can be provided in the form of a suspension. If the crumbles comprising the at least one
5 calcium carbonate-containing material are provided in form of a suspension, said crumbles are optionally dispersed. Conventional dispersants known to the skilled person can be used. The dispersant can be non-ionic, anionic, cationic, zwitterionic or amphoteric. A preferred dispersing agent is polyacrylate-based dispersant like a salt of a polyacrylate. Such dispersing agents are preferably present in the slurry in
10 an amount from about 0.2 wt.-% to about 3.0 wt.-%, based on the total dry weight of the crumbles.

Process for the preparation of the crumbles

15 It is appreciated that the inventors found that the properties of a calcium carbonate-containing material can be improved by a process comprising a specific sequence of process steps as defined herein.

A process for the preparation of crumbles comprising at least one calcium carbonate-containing material is provided. The process comprises the steps of:
20

- a) providing at least one calcium carbonate-containing material in the form of an aqueous slurry having solids content in the range from 5.0 to 45.0 wt.-%, based on the total weight of the slurry,
- b) wet grinding the at least one calcium carbonate-containing material of
25 step a) to obtain an aqueous slurry of the at least one wet-ground calcium carbonate-containing material, wherein the particles of the at least one wet-ground calcium carbonate-containing material have a
 - i) weight particle size d_{75} of 0.7 to 3.0 μm ,
 - ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,

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iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and

iv) a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by the measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010),

c) mechanical dewatering of the aqueous slurry of step b) to obtain crumbles comprising the at least one calcium carbonate-containing material having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles.

With regard to the definition of the crumbles comprising the at least one calcium carbonate-containing material and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the crumbles of the present invention.

It is appreciated that the at least one calcium carbonate-containing material of step a) is provided in the form of an aqueous slurry. In this respect, the at least one calcium carbonate-containing material provided in step a) may have any particle size distribution allowing the material to be subjected to a wet grinding step. Therefore, the at least one calcium carbonate-containing material may be provided as a comminuted material, for example, in crushed or preground form. Preferably, the at least one calcium carbonate-containing material of step a) is provided in a preground form.

According to one embodiment the at least one calcium carbonate-containing material of step a) is obtained by dry pregrinding. According to another embodiment of the present invention the at least one calcium carbonate-containing material of step a) is obtained by wet pregrinding and optional subsequent drying.

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In general, the pregrinding step for obtaining the at least one calcium carbonate-containing material of step a) can be carried out with any conventional grinding device, for example, under conditions such that refinement predominantly results from impacts with a secondary body, i.e. in one or more of: a ball mill, a rod mill, a
5 vibrating mill, a roll crusher, a centrifugal impact mill, a vertical bead mill, an attrition mill, a pin mill, a hammer mill, a pulveriser, a shredder, a de-clumper, a knife cutter, or other such equipment known to the skilled man. In case the at least one calcium carbonate-containing material provided in step a) comprises a wet preground calcium carbonate-containing material, the pregrinding step may be
10 performed under conditions such that autogenous grinding takes place and/or by horizontal ball milling, and/or other such processes known to the skilled man. The wet processed preground calcium carbonate-containing material thus obtained may be washed and dewatered by well known processes, e.g. by flocculation, filtration or forced evaporation prior to drying. The subsequent step of drying may be carried out
15 in a single step such as spray drying, or in at least two steps. It is also common that such a calcium carbonate-containing material undergoes a beneficiation step, such as a flotation, bleaching or magnetic separation step, to remove impurities.

According to one embodiment, the at least one calcium carbonate-containing
20 material provided in step a) has a weight median particle size d_{50} ranging from 0.1 to 200.0 μm , preferably from 0.2 to 100.0 μm , and more preferably from 0.5 to 50.0 μm , as measured by the sedimentation method.

The aqueous slurry of the at least one calcium carbonate-containing material has
25 solids content of from 5.0 wt.-% to 45.0 wt.-%, preferably from 10.0 wt.-% to 45.0 wt.-%, more preferably from 15.0 wt.-% to 45.0 wt.-% and most preferably from 20.0 wt.-% to 45.0 wt.-%, based on the total weight of the aqueous slurry. For example, the aqueous slurry of the at least one calcium carbonate-containing material provided in step a) has solids content of from 18.0 wt.-% to 45.0 wt.-% or from
30 30.0 wt.-% to 45.0 wt.-%, based on the total weight of the aqueous slurry.

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An aqueous "slurry" or "suspension" in the meaning of the present invention comprises insoluble solids and water and usually may contain large amounts of solids and, thus, can be more viscous and generally of higher density than the liquid from which it is formed.

5

The term "aqueous" slurry or suspension refers to a system, wherein the liquid phase comprises, preferably consists of, water. However, said term does not exclude that the liquid phase of the aqueous slurry comprises minor amounts of at least one water-miscible organic solvent selected from the group comprising methanol, ethanol, acetone, acetonitrile, tetrahydrofuran and mixtures thereof. If the aqueous slurry comprises at least one water-miscible organic solvent, the liquid phase of the aqueous slurry comprises the at least one water-miscible organic solvent in an amount of from 0.1 to 40.0 wt.-% preferably from 0.1 to 30.0 wt.-%, more preferably from 0.1 to 20.0 wt.-% and most preferably from 0.1 to 10.0 wt.-%, based on the total weight of the liquid phase of the aqueous slurry. For example, the liquid phase of the aqueous slurry consists of water.

The water to be used for preparing the aqueous slurry of step a) is tap water, deionized water, process water or rain water, or a mixture thereof. Preferably, the water used for preparing the aqueous slurry of step a) is tap water.

It is preferred that the aqueous slurry of the at least one calcium carbonate-containing material provided in step a) is free of dispersing agents.

According to step b) of the process according to the present invention, the at least one calcium carbonate-containing material of step a) is wet ground to obtain an aqueous slurry of the at least one wet-ground calcium carbonate-containing material such that the particles of the at least one wet-ground calcium carbonate-containing material have a

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- i) weight particle size d_{75} of 0.7 to 3.0 μm ,
- ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,
- iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and
- 5 iv) a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010).

It is appreciated that process step b) is preferably carried out in at least one grinding unit to obtain the wet ground calcium carbonate-containing material.

10

The term “wet grinding” in the meaning of the process according to the present invention refers to the comminution (e.g., in a ball mill) of solid material (e.g., of mineral origin) in the presence of water meaning that said material is in form of an aqueous slurry or suspension.

15

For the purposes of the present invention, any suitable mill known in the art may be used. However, process step b) is preferably carried out in a vertical or horizontal ball mill, more preferably a horizontal ball mill. Such vertical and horizontal ball mills usually consist of a vertically or horizontally arranged, cylindrical grinding chamber comprising an axially fast rotating agitator shaft being equipped with a plurality of paddles and/or stirring discs, such as described for example in EP 0607840 A1.

20

It is to be noted that process step b) is carried out by using at least one grinding unit, i.e. it is also possible to use a series of grinding units which may, for example, be selected from ball mills such as vertical or horizontal ball mills.

25

The amount of water being present during process step b) may be expressed by the total moisture content which is based on the total weight of said slurry. The process according to the present invention is characterized in that the grinding step is carried

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out at low solids contents, i.e. at high total moisture contents, for example at a total moisture content ranging from 65.0 to 90.0 wt.-%, based on the total weight of said slurry.

- 5 According to one embodiment, the total moisture content during process step b) ranges from 70.0 to 88.0 wt.-%, preferably from 73.0 to 86.0 wt.-%, and more preferably from 74.0 to 85.0 wt.-%, based on the total weight of the slurry.

- 10 Thus, it is appreciated that the aqueous slurry of the at least one wet-ground calcium carbonate-containing material during process step b) has solids content in the range from 10.0 to 35.0 wt.-%, preferably from 12.0 to 30.0 wt.-%, more preferably from 14.0 to 27.0 wt.-% and most preferably from 15.0 to 26.0 wt.-%, based on the total weight of the slurry.

- 15 Thus, it is appreciated that process step b) is carried out in that the aqueous slurry of the at least one wet-ground calcium carbonate-containing material provided in step a) is further diluted with water to the desired solids content during process step b).

- 20 Accordingly, the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) has lower solids content than the aqueous slurry of the at least one calcium carbonate-containing material provided in step a).

- 25 Thus, the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in process step b) has solids content in the range from 10.0 to 35.0 wt.-%, preferably from 12.0 to 30.0 wt.-%, more preferably from 14.0 to 27.0 wt.-% and most preferably from 15.0 to 26.0 wt.-%, based on the total weight of the slurry.

- 30 In one embodiment of the present process, step b) is carried out in the presence of at least one further particulate filler material.

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If process step b) is carried out in the presence of at least one further particulate filler material, the at least one further particulate filler material is preferably selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof.

Thus, if process step b) is carried out in the presence of at least one further particulate filler material, the aqueous slurry of the at least one calcium carbonate-containing material provided in step a) further comprises the at least one further particulate filler material. It is to be noted that the aqueous slurry of the at least one wet-ground calcium carbonate-containing material and the at least one further particulate filler material during process step b) has solids content in the range from 10.0 to 35.0 wt.-%, preferably from 12.0 to 30.0 wt.-%, more preferably from 14.0 to 27.0 wt.-% and most preferably from 15.0 to 26.0 wt.-%, based on the total weight of the slurry. Accordingly, the aqueous slurry of the at least one wet-ground calcium carbonate-containing material and the at least one further particulate filler material obtained in process step b) has solids content in the range from 10.0 to 35.0 wt.-%, preferably from 12.0 to 30.0 wt.-%, more preferably from 14.0 to 27.0 wt.-% and most preferably from 15.0 to 26.0 wt.-%, based on the total weight of the slurry.

It is to be noted that process step b) is carried out such that a wet-ground material having the particle size distribution as defined for the crumbles comprising the at least one calcium carbonate-containing material is obtained. Thus, it is appreciated that process step b) is carried out such that the weight median particle size d_{50} of the at least one wet-ground calcium carbonate-containing material obtained in step b) is decreased compared to the at least one calcium carbonate-containing material provided in step a). Accordingly, the at least one wet-ground calcium carbonate-containing material obtained in step b) has a i) weight particle size d_{75} of 0.7 to

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3.0 μm , ii) weight median particle size d_{50} of 0.5 to 2.0 μm , and weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method.

5 Additionally, process step b) is carried out such that a wet-ground material having the BET specific surface area as defined for the crumbles comprising the at least one calcium carbonate-containing material is obtained. Thus, it is appreciated that process step b) is carried out in that the BET specific surface area of the at least one wet ground calcium carbonate-containing material obtained in step b) is decreased compared to the at least one calcium carbonate-containing material provided in step
10 a). Accordingly, the at least one wet-ground calcium carbonate-containing material obtained in step b) has a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010).

It is preferred that process step b) is carried out in the absence of dispersing agents.
15 Thus, the aqueous slurry obtained in process step b) is preferably free of dispersing agents.

Wet grinding step b) is preferably carried out at a starting temperature which is of about room temperature or of elevated temperature. For the purposes of the process
20 according to the present invention, a temperature ranging from 15 $^{\circ}\text{C}$ to 85 $^{\circ}\text{C}$ is particularly suitable as starting temperature.

According to another embodiment, the starting temperature in step b) ranges from 15 $^{\circ}\text{C}$ to 60 $^{\circ}\text{C}$, preferably from 20 $^{\circ}\text{C}$ to 50 $^{\circ}\text{C}$ and most preferably from 20 $^{\circ}\text{C}$ to
25 40 $^{\circ}\text{C}$.

During wet grinding step b), the temperature is allowed to rise above the starting temperature of process step b). For example, the temperature in step b) may rise to a temperature of up to 100 $^{\circ}\text{C}$.

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It is a further requirement of the instant process that the aqueous slurry obtained in process step b) is subjected to a mechanical dewatering in process step c) such as to obtain crumbles comprising the at least one calcium carbonate-containing material having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles.

Such mechanical dewatering may be undertaken by all the techniques and methods well known to the man skilled in the art for reducing the water content of an aqueous slurry comprising at least one wet-ground calcium carbonate-containing material to solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the obtained crumbles. The mechanical dewatering in process step c) is preferably carried out in a vertical plate pressure filter, a tube press or a vacuum filter. More preferably, process step c) is carried out in a tube press.

A tube press is a membrane type filter press and capable of operating at high filtration pressures up to 150.0 bar. Preferably, process step c) is carried out under pressure, even more preferably a pressure from 20.0 bar to 140.0 bar, more preferably from 65.0 bar to 120.0 bar and most preferably from 80.0 to 110.0 bar.

The use of these high pressures enables a higher degree of separation of the liquid and solid phases. The principles of operation of a tube press are as follows:

The filtration takes place between two concentric cylinders. The outer cylinder is the casing, and the inner, the candle. The process slurry is pumped into the annular space between the filter medium and the bladder. Hydraulic fluid, usually water, is then pumped between the bladder and the casing putting the slurry under pressure and causing filtration to take place. When filtration is complete the hydraulic fluid is withdrawn from the tube unit using vacuum until the bladder is dilated against the casing. The candle is then lowered to the discharge position and a pulse of air is blown between the candle and the filter medium. This causes the filter cloth to

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expand, fracturing the cake which is discharged under gravity. When complete the candle closes to the slurry fill position to repeat the cycle.

5 The starting temperature of the mechanical dewatering of process step c) is preferably in the range of 15 to 80 °C, preferably at a starting temperature in the range of 20 to 70 °C, and more preferably at a starting temperature in the range of 30 to 60 °C. For example, the starting temperature of the mechanical dewatering of process step c) is about 50 °C.

10 The temperature during the mechanical dewatering of process step c) is preferably in the range of 15 to 80 °C, preferably in the range of 20 to 70 °C, and more preferably in the range of 30 to 60 °C. For example, the temperature during the mechanical dewatering of process step c) is about 50 °C.

15 It is one requirement of the instant invention that process step c) is carried out such that crumbles comprising the at least one calcium carbonate-containing material are obtained. The crumbles thus have solids content of 78.0 wt.-% to 90.0 wt.-% and preferably from 80.0 wt.-% to 88.0 wt.-%, based on the total weight of the crumbles.

20

In one embodiment of the instant process, the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) is partially dewatered to solids content in the range from 20.0 to 40.0 wt.-%, based on the total weight of the slurry, before process step c) is carried out.

25

Such optional dewatering may be undertaken by all the techniques and methods well known to the man skilled in the art for reducing the water content of an aqueous slurry comprising at least one wet-ground calcium carbonate-containing material to the desired solids content. The optional dewatering before process step c) can be

30 preferably carried out mechanically or thermally such as by filtration, centrifugation,

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sedimentation in a settling tank, evaporation etc., preferably by centrifugation or settling.

It is preferred that process step c) is carried out in the absence of dispersing agents.

- 5 Thus, the crumbles comprising the at least one calcium carbonate-containing material obtained in process step c) are preferably free of dispersing agents.

- The process according to the present invention may further comprise drying step d₁) (also referred to as “drying step”). In said drying step, the crumbles obtained in
10 step c) are dried to obtain dried crumbles.

- In general, the drying step according to the process according to the present invention may be carried out by any drying method known to the skilled person for drying materials having solids content from 78.0 to 90.0 wt.-%, based on the total
15 weight of the material.

- According to one embodiment, drying step d₁) is carried out in a cell mill as known by the skilled person. Preferably said drying step is carried out at a temperature ranging from 90 °C to 130 °C and preferably from 100 °C to 120 °C.
20

By means of drying step d₁), dried crumbles are obtained having a low total moisture content which is less than or equal to 3.0 wt.-%, based on the total weight of said dried crumbles.

- 25 Thus, it is appreciated that the crumbles comprising the at least one calcium carbonate-containing material obtained in optional drying step d₁) have solids content of ≥ 97.0 wt.-%, and most preferably from 97.0 to 99.98 wt.-%, based on the total weight of the crumbles.

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In one embodiment of the present invention, the process according to the present invention for the preparation of crumbles comprising at least one calcium carbonate-containing material further comprises a process step d₂) of treating the crumbles obtained in step c) with a hydrophobizing agent (also referred to as “treatment step”)
5 in order to obtain surface-treated crumbles. By means of said treatment step, a treatment layer comprising the hydrophobizing agent is formed on at least a part of the accessible surface area of the calcium carbonate-containing material particles.

The hydrophobizing agent used in treatment step d₂) may be any agent known to the
10 skilled person which is capable to form a hydrophobic treatment layer on at least a part of the accessible surface area of the calcium carbonate-containing material particles.

In one embodiment, the hydrophobizing agent in treatment step d₂) is an aliphatic
15 carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and one or
20 more phosphoric acid di-ester.

With regard to the definition of the aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24, the at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a
25 linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent, the phosphoric acid ester blend of one or more phosphoric acid mono-ester and one or more phosphoric acid di-ester and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the crumbles of the present invention.

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In one embodiment of the process according to the present invention, the temperature in treatment step d₂) ranges from 70 °C to 140 °C, preferably from 75 °C to 130 °C, and more preferably from 80 °C to 125 °C.

- 5 In one embodiment, the treatment step may be carried out directly after mechanical dewatering step c) or, if present, after drying step d₁) or before use.

The surface-treated crumbles obtained after treatment step d₂) preferably have a low total moisture content. Therefore, according to one embodiment, said surface-treated
10 crumbles have a total moisture content of less than or equal to 3.0 wt.-%, based on the total weight of said crumbles.

Thus, it is appreciated that the crumbles comprising the at least one calcium carbonate-containing material obtained in optional treatment step d₂) have solids
15 content of ≥ 97.0 wt.-%, preferably from 97.0 to 99.97 wt.-% and most preferably from 98.0 to 99.97 wt.-%, based on the total weight of the crumbles.

Additionally or alternatively, the process according to the present invention for the preparation of crumbles comprising at least one calcium carbonate-containing
20 material further comprises a process step d₃) of treating the crumbles obtained in step c) with a dispersing agent (also referred to as “dispersing step”) in order to obtain dispersed crumbles.

Such dispersing step d₃) can be carried out by the use of common dispersing agents.
25 Preferred dispersing agents are polyacrylate-based dispersants like a salt of a polyacrylate. The dispersing agent is preferably selected from the group consisting of an acrylic polymer, an acrylic and a vinylic copolymer and mixtures thereof. Dispersing agents such as acrylic polymers, acrylic and vinylic copolymers or mixtures thereof having multiple acidic sites can be partially or totally neutralised. In
30 one embodiment, the dispersing agent which may be used in dispersing step d) is

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partially or completely neutralized, preferably to a degree of 5.0 % to 100.0 %, more preferably to a degree of 25.0 % to 100.0 % and most preferably to a degree of 75.0 % to 100.0 % using a neutralizing agent containing ions of alkali metals and/or alkaline earth metals. For example, the acidic sites of the dispersing agent are

5 neutralized using a neutralizing agent containing only sodium. Alternatively, the acidic sites of the dispersing agent are neutralized using a neutralizing agent containing only potassium. In one embodiment, the acidic sites of the dispersing agent are neutralized using a neutralizing agent containing a mixture of sodium and potassium.

10

Dispersing step d₃) can be performed by the use of any suitable means, and is preferably conducted by the use of a high sheer disperser.

15

For example, dispersing step d₃) is carried out in that an aqueous slurry of the crumbles comprising the at least one calcium carbonate-containing material is formed by suspending the crumbles obtained in process step c) and a dispersing agent in water.

20

According to one embodiment, the aqueous slurry of dispersed crumbles obtained in dispersing step d₃) has solids content of from 10.0 wt.-% to 82.0 wt.-%, preferably from 50.0 wt.-% to 81.0 wt.-%, and most preferably from 50.0 wt.-% to 78.0 wt.-%, based on the total weight of the aqueous slurry.

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According to another aspect of the instant invention, crumbles comprising at least one calcium carbonate-containing material are provided, in which the crumbles are obtainable by the process for the preparation of the crumbles.

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Articles and uses

As the inventive crumbles have a low moisture pick up susceptibility, a defined particle size distribution, BET surface area and top cut as well as a favourable
5 handling, they can be used in a great variety of articles. Thus, the present invention refers in a further aspect to an article comprising the crumbles comprising at least one calcium carbonate-containing material as defined above. Preferably, the article is selected from the group comprising plastic, food, cosmetic, sealants, pharmaceutical, paper, paper coating, coating, paint, adhesive articles and mixtures thereof.

10

With regard to the definition of the crumbles comprising the at least one calcium carbonate-containing material and preferred embodiments thereof, reference is made to the statements provided above when discussing the technical details of the crumbles of the present invention.

15

In one embodiment, the crumbles comprising at least one calcium carbonate-containing material are preferably used in a plastic article.

As the crumbles have a low moisture pick up susceptibility, it may advantageously
20 be used in paper coatings in order to adjust the printing properties of a coated paper. Furthermore, the crumbles may also be used in exterior paints and bathroom paints.

The use of the crumbles according to the present invention as a filler material in plastic articles may also be of particular advantage due to the absence of biocides
25 and/or dispersing agents and the low moisture pick up susceptibility. For example, said crumbles may be used in thermoplastic polymers, such as polyvinyl chloride, polyolefins, and polystyrene.

Moreover, the crumbles may also be used in coatings such as polymer coatings
30 which may be applied on the surface of plastic articles, such as foils, in order to

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increase the hydrophobicity (e.g., reflected by an increased contact angle measured against water) of said surface.

According to one embodiment, the crumbles are used in a polymer composition,
5 wherein said polymer composition comprises:

- a) at least one polymeric resin; and
- b) from 0.1 to 90.0 wt.-%, preferably from 1.0 to 85.0 wt.-%, and more preferably from 2.0 to 45.0 wt.-%, based on the total weight of said polymer composition, of the instant crumbles comprising at least one
10 calcium carbonate-containing material.

According to another embodiment, said at least one polymeric resin is a thermoplastic resin and preferably is a polyolefin, polyvinylchloride, or polystyrene.

15 According to another embodiment, said at least one polymeric resin is a polyolefin and preferably polyethylene or polypropylene.

According to still another embodiment, said at least one polymeric resin is polyvinylchloride.
20

According to still another embodiment, said at least one polymeric resin is polystyrene.

The polymer composition of the present invention may be used in a number of
25 processes including the manufacture of plastic articles such as blown films, sheets, or pipe profiles, in processes such as extrusion of pipes, profiles, cables, fibres or the like, and in compression molding, injection molding, thermoforming, blow molding, rotational molding, etc.

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In this respect, said polymer composition may be directly used in the manufacture of plastic articles. Therefore, in one embodiment of the present invention, the polymer composition comprises the crumbles in an amount from 1.0 to 50.0 wt.-%, preferably of from 5.0 to 45.0 wt.-% and most preferably from 10.0 to 40.0 wt.-%, based on the
5 total weight of the polymer composition.

In an alternative embodiment, the polymer composition may be used as a masterbatch.

10 The term "masterbatch" refers to a composition having a concentration of the crumbles that is higher than the concentration in the polymer composition used for preparing the final application product. That is to say, the masterbatch is further diluted such as to obtain a polymer composition which is suitable for preparing the final application product.

15

For example, a polymer composition according to the present invention suitable to be used as a masterbatch comprises the crumbles in an amount of from 50.0 to 95.0 wt.-%, preferably from 60.0 to 95.0 wt.-%, and more preferably from 70.0 to 95.0 wt.-%, based on the total weight of the polymer composition.

20

Thus, the crumbles comprising the at least one calcium carbonate-containing material can be used in paper making, paper coating, food, plastic, agricultural, paint, coatings, adhesive, sealant, pharmaceutical, agricultural, construction and/or cosmetic applications. In particular, said crumbles comprising the at least one
25 calcium carbonate-containing material can be used as mineral filler and/or for coating of paper. Alternatively, the crumbles comprising the at least one calcium carbonate-containing material are used in plastic articles.

Thus, the present invention refers in another aspect to the use of the crumbles
30 comprising the at least one calcium carbonate-containing material in paper making,

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paper coating, food, plastic, agricultural, paint, coatings, adhesive, sealant, pharmaceutical, agricultural, construction and/or cosmetic applications.

5 The scope and interest of the invention will be better understood based on the following figures and examples which are intended to illustrate certain embodiments of the invention and are non-limitative.

Examples

10

1. Measurement methods

In the following, materials and measurement methods implemented in the examples are described.

15

Particle size distribution (mass % particles with a diameter $< X$) and weight median diameter (d_{50}) of a particulate material

Weight grain diameter and grain diameter mass distribution of a particulate material were determined via the sedimentation method, i.e. an analysis of sedimentation
20 behaviour in a gravitational field. The measurement was made with a SedigraphTM 5120 or a SedigraphTM 5100 of Micromeritics Instrument Corporation.

The method and the instrument are known to the skilled person and are commonly used to determine grain size of fillers and pigments. The measurement is carried out
25 in an aqueous solution of 0.1 wt.-% $\text{Na}_4\text{P}_2\text{O}_7$. The samples are dispersed using a high speed stirrer and supersonics.

BET specific surface area of a material

Throughout the present document, the specific surface area (in m^2/g) of a particulate material was determined using the BET method (using nitrogen as adsorbing gas), which is well known to the skilled man (ISO 9277:1995). The total surface area (in m^2) of the particulate material is then obtained by multiplication of the specific surface area and the mass (in g) of the particulate material. The method and the instrument are known to the skilled person and are commonly used to determine the specific surface of particulate materials.

10 Solids content

The solids content (also known as “dry weight”) was determined using a Moisture Analyser HR73 from the company Mettler-Toledo, Switzerland, with the following settings: temperature of 120°C , automatic switch off 3, standard drying, 5 to 20 g of product.

15

Calcium carbonate content of a particulate material

For the measurement of the calcium carbonate content of a particulate material, about 10.000 grams of the dry sample (dried at 110°C for 5 hours in an oven) were weighed in a flask/beaker and a small amount of demineralized water was added.

20 Then, 40 mL of hydrochloric acid (25% p.a.) were added to the respective sample and after the CO_2 development stopped, the mixture was boiled for about 5 min. After cooling down, the mixture was filtered through a $0.8\ \mu\text{m}$ cellulose-acetate filter and washed thoroughly. Then the filtrate was quantitatively rinsed to a volumetric flask with distilled water and filled up to 1000.0 ml at 20°C .

25

The thus obtained filtrate was then slowly titrated by pipetting 10.00 mL of the obtained filtrate (about 20°C) into a Memotitrator-beaker and 1.0 g (± 0.2 g) of triethanolamine puris. and 3.0 g of $\text{MgSO}_4 \times 7\ \text{H}_2\text{O}$. The mixture was diluted with demineralized water up to 70 mL and then, just before the titration, 10.0 mL of 2N sodium hydroxide and 7 to 9 drops of a HHSNN-methanol solution (0.2 wt.-% of

30

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HHSNN in methanol) were added to the mixture. After the pre-dosing, the titrator stirred the mixture for 60 s and then the phototrode voltage was set to 900 to 1150 mV during titration. The calcium carbonate content was displayed in percent.

5 **Moisture content**

The moisture content of a particulate material was determined by thermogravimetric analysis (TGA). TGA analytical methods provide information regarding losses of mass with great accuracy, and is common knowledge; it is, for example, described in "Principles of Instrumental analysis", fifth edition, Skoog, Holler, Nieman, 1998 (first edition 1992) in Chapter 31 pages 798 to 800, and in many other commonly known reference works. In the present invention, thermogravimetric analysis (TGA) is performed using a Mettler Toledo TGA 851 based on a sample of 500 +/- 50 mg and scanning temperatures from 25 °C to 350 °C at a rate of 20 °C/minute under an air flow of 70 ml/min.

15

Alternatively, the moisture content of the particles was determined by the oven method.

Moisture pick-up susceptibility

20 The term "moisture pick up susceptibility" in the meaning of the present invention refers to the amount of moisture absorbed on the surface of the calcium carbonate-containing particles and is determined in mg moisture/g of the dry crumbles after exposure to an atmosphere of 50% of relative humidity for 48 hours at a temperature of 23°C.

25

Pigment whiteness, paper opacity, light scattering and CIELAB

Pigment whiteness R457 and paper opacity were measured using an ELREPHO 3000 from the company Datacolor according to ISO 2469:1994 (DIN 53145-2:2000 and DIN 53146:2000). The CIELAB L*, a*, b* coordinates were measured using an

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ELREPHO 3000 from the company Datacolor according to EN ISO 11664-4 and barium sulfate as standard.

Charpy impact strength

- 5 Charpy impact strength ($23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and 50 % relative humidity ± 10 % relative humidity) was measured according to ISO 179/1eA on extruded samples which were cut out of the extrudate in machine direction.

Breaking force and elongation at break

- 10 The breaking force is the force needed to be applied on a yarn to make it break. It is expressed in Newton [N]. The elongation at break is the increase of the length produced by stretching a yarn to its breaking point. It is expressed as a percentage [%] of its initial length.

15 Tenacity

The tenacity is calculated from the breaking force and the linear density, and expressed in centinewton per tex [cN/tex]. The test is carried out on a dynamometer with a constant stretching speed, applicable standards for this test are EN ISO 5079 and ASTM D 3822.

20

Tensile index

The tensile index is the product of tenacity [cN/tex] and the square root of the elongation at break [%].

25 Tensile strength and elongation

Tensile strength [kN/m] and the elongation at maximum load [%] are measured in machine direction (MD) and in cross machine direction (CD). The energy value according to EN ISO 10319 is calculated by the tensile strength $(\text{MD} + \text{CD})/2$.

Surface Gloss

The surface gloss was measured with a Byk Spectro Guide Sphere Gloss at an angle of 60° from the plane surface according to ISO 2813:1994. The gloss value is determined by calculating the average value of n measurement. In the present set up

5 n=10.

Filter pressure value

The filter pressure test provides for the Filter Pressure Value. The Filter Pressure Value FPV is defined as the increase of pressure per gram filler. This test is

10 performed to determine the dispersion quality and/or presence of excessively coarse particles or agglomerates of mineral materials in a masterbatch. Low Filter Pressure Values refer to a good dispersion and fine material, wherein high Filter Pressure Values refer to bad dispersion and coarse or agglomerated material.

15 The Filter Pressure test was performed on a commercially available Collin Pressure Filter Test, Teach-Line FT-E20T-IS, according to the standard EN 13900-5. Filter type used was 14 µm and 25 µm, extrusion was carried out at 200°C.

K-Value of PVC: A measure of the molecular weight of PVC based on

20 measurements of viscosity of a PVC solution. It ranges usually between 35 and 80. Low K-values imply low molecular weight (which is easy to process but has inferior properties) and high K-values imply high molecular weight, (which is difficult to process, but has outstanding properties). In general, K-values for a particular PVC resin are provided by the resin producer either on the packaging or the accompanying

25 technical data sheet.

2. Examples

The following crumbles were prepared:

5 Crumbles A:

Crumbles A of a calcium carbonate-containing material were obtained by wet grinding an aqueous slurry of calcium carbonate (marble; $d_{50} = 1.6 \mu\text{m}$) having solids content of about 35.0 wt.-%, based on the total weight of the slurry. The slurry was wet ground in a vertical ball mill to a final particle size distribution as described in
10 table 1 herein below. The slurry obtained after wet grinding had solids content of about 20.0 wt.-%, based on the total weight of the slurry.

The wet ground calcium carbonate-containing material was then dewatered by using a vertical tube press filter (Metso Corporation, Finland) operating at about 95 bars
15 and a temperature of about 50 °C. The pressure is reached by a hydraulic system. The obtained crumbles A had properties as described in table 1 below.

Table 1: Properties of the crumbles

	Crumbles A	Crumbles B	Crumbles C	Crumbles D
$d_{50} [\mu\text{m}]$	1.6	0.8	1.5	1.0
<1 μm (by sedimentation) [wt.-%]	30	60	33.3	45
< 2 μm (by sedimentation) [wt.-%]	55	90	62.1	75
sc final [wt.-%]	85-88	85	86.6	85
Brightness	> 94	> 94	94.6	> 93
Yellowness index	< 1.5	< 1.5	1.1	< 1.5
Cielab a*	≈ 0	≈ 0	≈ 0	≈ 0

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Cielab b*	≈ 0.5	≈ 0.4	0.6	≈ 0.6
Cielab L*	≈ 97	≈ 97	98.2	≈ 98
BET surface area [m ² /g]	4-5	6-7	5.7	6

Crumbles B:

Crumbles B of a calcium carbonate-containing material were obtained by wet grinding an aqueous slurry of calcium carbonate (marble; $d_{50} = 0.8 \mu\text{m}$) having solids content of about 35.0 wt.-%, based on the total weight of the slurry. The slurry was wet ground in a vertical ball mill to a final particle size distribution as described in table 1 herein below. The slurry obtained after wet grinding had solids content of about 20.0 wt.-%, based on the total weight of the slurry.

10

The wet ground calcium carbonate-containing material was then dewatered by using a vertical tube press filter (Metso Corporation, Finland) operating at about 95 bars and a temperature of about 50 °C. The pressure is reached by a hydraulic system. The obtained crumbles B had properties as described in table 1 above.

15

The obtained crumble particles were further surface-treated by using stearic acid. 200 g of the obtained crumbles were diluted with water to solids content of 20.0 wt.-%, based on the total weight of the obtained slurry, and heated up to 80 °C.

20 A 0.4 M solution of stearic acid was prepared by mixing 4.1 g of stearic acid with 40 ml of deionised water under stirring at a temperature of 85 °C. After 30 min of stirring 2.5 g of a 30 wt.-% sodium hydroxide solution was added to the stearic acid solution (stearic acid/hydroxide mole ratio 1/1.3).

25 The heated sodium stearate solution was added to the crumble slurry such that a treatment level of 0.5 and 0.7 wt.-%, based on the total weight of the crumbles,

- 65 -

respectively, was obtained and stirred for 60 min at 85 °C. Subsequently, the slurry was allowed to cool down and pressure filtered afterwards to solids content of about 93.7 wt.-%, based on the total weight of the obtained product.

- 5 The obtained surface-treated crumbles B1 (treatment level: 0.5 wt.-%) and B2 (treatment level: 0.7 wt.-%) had properties as described in table 2 below.

Table 2: Properties of surface-treated crumbles B1 and B2

	Crumbles B1	Crumbles B2
d_{50} [μm]	0.89	0.9
<1 μm (by sedimentation) [wt.-%]	56.5	56.1
< 2 μm (by sedimentation) [wt.-%]	87.8	87.0
d_{98} [μm]	4.4	4.1
Brightness	95.4	94.8
Yellowness index	1.2	1.3
Cielab a*	0.0	0.0
Cielab b*	0.7	0.7
Cielab L*	98.5	98.3
BET surface area [m^2/g]	6.3	6.4

10

Crumbles C:

Crumbles C of a calcium carbonate-containing material were obtained by wet grinding an aqueous slurry of calcium carbonate (marble; $d_{50} = 1.5 \mu\text{m}$) having solids content of about 35.0 wt.-%, based on the total weight of the slurry. The slurry was

15 wet ground in a vertical ball mill to a final particle size distribution as described in

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table 1 herein below. The slurry obtained after wet grinding had solids content of about 20.0 wt.-%, based on the total weight of the slurry.

The wet ground calcium carbonate-containing material was then dewatered by using
 5 a vertical tube press filter (Metso Corporation, Finland) operating at about 95 bars and a temperature of about 50 °C. The pressure is reached by a hydraulic system. The obtained crumbles C had properties as described in table 1 above.

The obtained crumble particles were further surface-treated by using stearic acid as
 10 described for crumbles B above. The sodium stearate solution was added to the crumble slurry such that a treatment level of 0.9 and 1.2 wt.-%, based on the total weight of the crumbles, respectively, on the crumbles was obtained.

The obtained surface-treated crumbles C1 (treatment level: 0.9 wt.-%) and C2
 15 (treatment level: 1.2 wt.-%) had properties as described in table 3 below.

Table 3: Properties of surface-treated crumbles C1 and C2

	Crumbles C1	Crumbles C2
d_{50} [μm]	5.5	5.8
<1 μm (by sedimentation) [wt.-%]	33.5	37.7
< 2 μm (by sedimentation) [wt.-%]	63.9	67.0
d_{98} [μm]	5.5	5.8
Brightness	94.1	92.7
Yellowness index	1.4	1.7
Cielab a*	0.0	0.0
Cielab b*	0.8	0.9

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Cielab L*	98.1	97.6
BET surface area [m ² /g]	4.7	4.5

Crumbles D:

Crumbles D of a calcium carbonate-containing material were obtained by wet grinding an aqueous slurry of calcium carbonate (marble; $d_{50} = 1.0 \mu\text{m}$) having solids content of about 35.0 wt.-%, based on the total weight of the slurry. The slurry was wet ground in a vertical ball mill to a final particle size distribution as described in table 1 herein below. The slurry obtained after wet grinding had solids content of about 20.0 wt.-%, based on the total weight of the slurry.

10

The wet ground calcium carbonate-containing material was then dewatered by using a vertical tube press filter (Metso Corporation, Finland) operating at about 95 bars and a temperature of about 50 °C. The pressure is reached by a hydraulic system. The obtained crumbles D had properties as described in table 1 above.

15

The obtained crumble particles were further surface-treated by using stearic acid as described for crumbles B above. The sodium stearate solution was added to the crumble slurry such that a treatment level of 0.8 wt.-%, based on the total weight of the crumbles, on the crumbles was obtained.

20

3. Application

The crumbles prepared above were tested in the following applications:

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A) Application in PVC

The crumbles B1 and B2 were tested in the PVC profile extrusion as described in table 4 below.

5 Table 4: Preparation and testing of samples

Example	B1 (inventive)	B2 (inventive)	Reference 1	Reference 2	Reference 3
PVC K-value 66 (Evipol SH6630)	100 (phr)	100 (phr)	100 (phr)	100 (phr)	100 (phr)
Ca-Zn containing stabilizer (Stabilox CZ 2913 GN)	4.3 (phr)	4.3 (phr)	4.3 (phr)	4.3 (phr)	4.3 (phr)
Lubricant: 12-Hydroxy stearic acid (Realube AIS)	0.2 (phr)	0.2 (phr)	0.2 (phr)	0.2 (phr)	0.2 (phr)
Lubricant: PE wax (Realube 3010)	0.15 (phr)	0.15 (phr)	0.15 (phr)	0.15 (phr)	0.15 (phr)
Titanium dioxide (Kronos 2220)	3.5 (phr)	3.5 (phr)	3.5 (phr)	3.5 (phr)	3.5 (phr)
Acrylic impact modifier (Paraloid KM 366)	6 (phr)	6 (phr)	6 (phr)	6 (phr)	6 (phr)
Crumbles	8 or 16 (phr)	8 or 16 (phr)	8 or 16 (phr)	8 (phr)	8 or 16 (phr)

The term “phr” in the meaning of the present invention means “parts per hundred resins”. In particular, if 100 parts of polymer are used, the quantity of other
 10 ingredients is expressed in relation to this 100 parts of polymer by weight.

The reference materials are as follows:

Reference 1: calcium carbonate, commercially available from Omya,
 15 Switzerland, having a d_{50} of 0.8 μm , a d_{98} of 5 μm and a BET
 specific surface area of 8 to 9 m^2/g . The particles have a Cielab
 a^* of 0.3, a Cielab b^* of 1.8 and a Cielab L^* of 97.5. The

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calcium carbonate is surface-treated by using stearic acid and has a treatment level of 0.8 to 0.9 wt.-%, based on the total weight of the calcium carbonate.

5 Reference 2: calcium carbonate, commercially available from Omya, Switzerland, having a d_{50} of 0.8 μm , a d_{98} of 4 μm and a BET specific surface area of 11 m^2/g . The particles have a Cielab a^* of -0.2, a Cielab b^* of 0.5 and a Cielab L^* of 97.5. The calcium carbonate is surface-treated by using stearic acid and has a treatment level of 1.0 wt.-%, based on the total weight of the calcium carbonate.

10

 Reference 3: calcium carbonate, commercially available from Omya, Switzerland, having a d_{50} of 0.8 μm , a d_{98} of 4 μm and a BET specific surface area of 11 m^2/g . The calcium carbonate is surface-treated by using stearic acid and has a treatment level of 2.0 wt.-%, based on the total weight of the calcium carbonate.

15

The components for the inventive as well as comparative examples were previously mixed using the usual hot/cold mixing process known to the skilled person, and extruded on a Göttfert extrusion line equipped with a Krauss-Maffei plastification unit, L/D 32, with counter rotating parallel twin screws, the screws having a diameter of 30 mm each.

20

The prepared extruded profiles were tested with regard to the charpy impact resistance (ISO 179/1fC) and gloss 60°[-]. The results can be gathered from Fig. 1 and 2. As can be gathered from Fig. 1 and 2, the inventive sample B1 and B2 provides for an increase in charpy impact resistance (ISO 179/1fC) with same amount (16 phr) of crumbles of the present invention in comparison to the references 1 to 3. Gloss 60°[-] of the inventive samples B1 and B2 is not affected to the negative and remains within the tolerances, see Fig. 2. Further optical properties as

25

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described in Table 5 below such as brightness - see L*-value, are also not affected to the negative and red-/ yellowness- values - see a*/b*-values, remain within the tolerances and thus the overall benefit provided by the present invention is shown.

5 Table 5: optical properties of extruded profiles

Samples	CIELAB L* (brightness)	CIELAB a* (green-red)	CIELAB b* (blue-yellow)
Reference 1 - 8 phr	95.7	-0.33	3.56
Reference 2 - 8 phr	96.2	-0.47	3.57
Reference 3 - 8 phr	96.0	-0.43	3.64
Reference 3 - 16 phr	95.9	-0.46	3.73
B2 - 8 phr	96.0	-0.48	3.55
B1 - 8 phr	96.2	-0.47	3.52
B2 - 16 phr	95.9	-0.46	3.73
B1 - 16 phr	95.9	-0.45	3.73

B) Application in PE

10 The crumbles C1 and C2 were tested in PE extrusion.

The crumbles C1 and C2 of the present invention were made into a master batch of a linear low density polyethylene (LLDPE; MFI = 1 g/10 min, ExxonMobil 1001) as outlined in table 6 below.

15

A filter pressure test was performed in order to determine the filter pressure value FPV of such LLDPE master batch and compared to the FPV a master batch comprising a calcium carbonate of the prior art. The results are given in Table 6 below.

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Table 6: composition of the master batch and FPV

	Crumbles C1	Crumbles C2	Reference 4
Amount of crumbles [wt.-%]	65	65	65
Amount of LLDPE <u>Exxon Mobil 1001</u> [wt.-%]	35	35	35
Filter pressure at 14 µm pore size [bar/g]	1.3	1.7	1.6

The reference material is as follows:

- 5 Reference 4: calcium carbonate, commercially available from Omya, Switzerland, having a d_{50} of 1.7 µm, a d_{98} of 8 µm and a BET specific surface area of 4 to 5 m²/g. The particles have a Cielab a* of 0.1, a Cielab b* of 1.1 and a Cielab L* of 98.5. The calcium carbonate is surface-treated by using stearic acid and has a
- 10 treatment level of 0.7 to 0.8 wt.-%, based on the total weight of the calcium carbonate.

The crumbles of the present invention clearly show their beneficial properties over reference 4 when made into a master batch. The pressure on the pore filter at 14 µm

15 shows that the crumbles C1 of to the present invention, shows reduced pressure build up at the pore size filter, thus demonstrating the advantageous properties, the improved dispersion of the crumble particles in the polymer matrix.

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Further to this, said filled LLDPE master batches were made into blown film by means known to the skilled person. Samples of the said blown films comprising the crumbles C1 and C2 of the present invention and samples of blown films comprising the reference 4 are compared hereafter in table 7. Different amounts of filled master batch were mixed with a further LLDPE (Dowlex 5056G; C8-LLDPE, MFI = 1 g/10 min,) and blown films were made from these mixtures on a Dr. Collin film line. The content of the crumbles C1 and C2 and of the reference 4 in the final films were 20 wt.-%, based on the total weight of the respective final film. Films having a width of 22 cm, a film grammage of 35 g/m² and a frost line position at 15 cm were prepared.

10

The mechanical properties of the prepared films are outlined in table 7 below.

Table 7: mechanical properties of prepared films

Formulation	1	2	3
CaCO ₃	C1	C2	Reference 4
Universal tests			
Yield, MD ¹ [N/mm ²]	9.6	9.8	9.8
Yield, CD ² [N/mm ²]	9.8	10.0	9.9
Elongation at break, MD ¹ [%]	536	541	505
Elongation at break, CD ² [%]	572	574	540
Force at break, MD ¹ [N/mm ²]	36.7	38.5	31.2
Force at break, CD ² [N/mm ²]	33.1	33.3	28.5
E-modulus, MD ¹ [N/mm ²]	283	291	301
E-modulus, CD ² [N/mm ²]	312	318	321

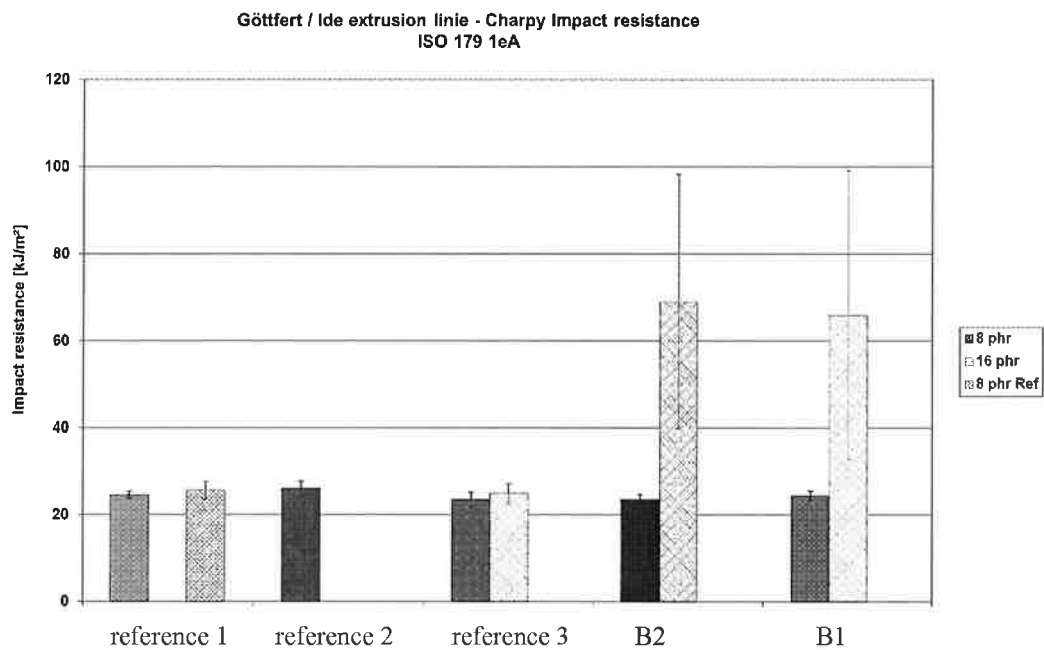
¹ MD refers to machine direction, ² CD refers to cross direction.

15

As can be seen from table 7, the inventive crumbles C1 and C2 gave better force at break as well as dart drop resistance compared to the reference 4.

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Figures



5

Fig. 1

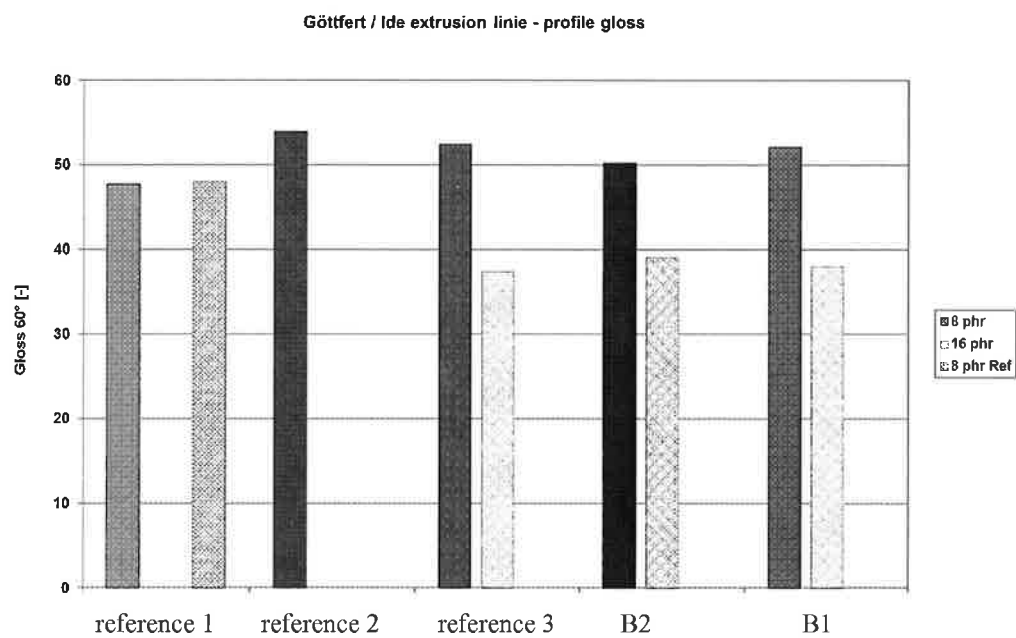


Fig. 2

14 169 923.1-1375

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5 OMYA INTERNATIONAL AG

New Claims

(clean version)

- 10 1. Crumbles comprising at least one calcium carbonate-containing material,
the crumbles
a) having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total
weight of the crumbles,
b) comprising particles of the at least one calcium carbonate-
15 containing material having a
i) weight particle size d_{75} of 0.7 to 3.0 μm ,
ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,
iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to
the sedimentation method, and
20 c) comprising particles of the at least one calcium carbonate-containing
material having a BET specific surface area of from 4.0 to 12.0 m^2/g ,
measured by nitrogen gas adsorption using the BET isotherm (ISO
9277:2010).
- 25 2. The crumbles according to claim 1, wherein the at least one calcium
carbonate-containing material is at least one natural calcium carbonate-
containing material, preferably dolomite and/or at least one ground calcium
carbonate (GCC), more preferably at least one ground calcium carbonate
(GCC) and most preferably at least one ground calcium carbonate (GCC)
30 selected from the group comprising marble, chalk, limestone and mixtures
thereof.

- 2 -

3. The crumbles according to claim 1 or 2, wherein the crumbles comprise
- a) at least one further particulate filler material, preferably at least one further particulate filler material selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or
- 5 aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof, and/or
- b) on at least a part of the accessible surface area of the calcium
- 10 carbonate-containing material particles a treatment layer comprising a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or reaction products thereof and/or at least one mono-substituted succinic anhydride consisting
- 15 of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent and/or reaction products thereof and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and/or reaction products thereof and one or more phosphoric acid di-ester and/or reaction products thereof.
- 20
4. The crumbles according to any one of claims 1 to 3, wherein the crumbles have
- a) a moisture pick up susceptibility such that its total surface moisture level is
- 25 ≤ 0.6 mg/g, preferably ≤ 0.5 mg/g, more preferably ≤ 0.4 mg/g and most preferably ≤ 0.3 mg/g of the dry crumbles after exposure to an atmosphere of 50% of relative humidity for 48 hours at a temperature of 23°C, and/or
- b) a moisture content of from 0.2 wt.-% to 0.6 wt.-%, preferably from 0.2 wt.-% to 0.4 wt.-% and most preferably from 0.25 wt.-% to 0.35 wt.-% based on the total dry weight of the crumbles.
- 30

- 3 -

5. Process for the preparation of crumbles comprising at least one calcium carbonate-containing material as defined in any one of claims 1 to 4, the process comprising the steps of:
- a) providing at least one calcium carbonate-containing material in the form of
5 an aqueous slurry having solids content in the range from 5.0 to 45.0 wt.-%, based on the total weight of the slurry,
- b) wet grinding the at least one calcium carbonate-containing material of step a) to obtain an aqueous slurry of the at least one wet-ground calcium carbonate-containing material, wherein the particles of the at least one
10 wet-ground calcium carbonate-containing material have a
- i) weight particle size d_{75} of 0.7 to 3.0 μm ,
ii) weight median particle size d_{50} of 0.5 to 2.0 μm ,
iii) weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and
15 iv) a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010),
- c) mechanical dewatering of the aqueous slurry of step b) to obtain crumbles comprising the at least one calcium carbonate-containing material having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of
20 the crumbles.
6. The process according to claim 5, wherein the aqueous slurry of the at least one calcium carbonate-containing material of step a) is free of dispersing agents and/or wet-grinding step b) and/or mechanical dewatering step c)
25 is/are carried out in the absence of dispersing agents.
7. The process according to claim 5 or 6, wherein the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) has

- 4 -

- a) lower solids content than the aqueous slurry of the at least one calcium carbonate-containing material provided in step a), and/or
- b) solids content in the range from 10.0 to 35.0 wt.-%, based on the total weight of the slurry.

5

8. The process according to any one of claims 5 to 7, wherein process step b) is carried out in the presence of at least one further particulate filler material, preferably at least one further particulate filler material selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof.

10

9. The process according to any one of claims 5 to 8, wherein the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) is partially dewatered to solids content in the range from 20.0 to 40.0 wt.-%, based on the total weight of the slurry, before process step c) is carried out.

15

20

10. The process according to any one of claims 5 to 9, wherein process step c) is carried out under pressure, preferably a pressure from 20.0 bar to 140.0 bar, more preferably from 65.0 bar to 120.0 bar and most preferably from 80.0 to 110.0 bar.

25

11. The process according to any one of claims 5 to 10, wherein process step c) is carried out in a vertical plate pressure filter, a tube press or a vacuum filter, preferably in a tube press.

- 5 -

12. The process according to any one of claims 5 to 11, wherein the process further comprises step d) of
- a) treating the crumbles comprising the at least one calcium carbonate-containing material obtained in step c) with a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and one or more phosphoric acid di-ester, to obtain surface-treated crumbles comprising on at least a part of the accessible surface area of the calcium carbonate-containing material particles a treatment layer comprising the hydrophobizing agent, and/or
- b) drying the crumbles comprising the at least one calcium carbonate-containing material obtained in step c) to solids content of ≥ 97.0 wt.-%, and most preferably from 97.0 to 99.98 wt.-%, based on the total weight of the crumbles, and/or
- c) dispersing the crumbles by using a polyacrylate-based dispersant.
13. Article comprising the crumbles comprising at least one calcium carbonate-containing material according to any one of claims 1 to 4.
14. The article of claim 13, wherein the article is selected from the group comprising plastic, food, cosmetic, sealant, pharmaceutical, paper, paper coating, coating, paint, adhesive articles and mixtures thereof.
15. Use of crumbles comprising at least one calcium carbonate-containing material according to any one of claims 1 to 4 in paper making, paper coating,

- 6 -

food, plastic, agricultural, paint, coatings, adhesives, sealants,
pharmaceuticals, agricultural, construction and/or cosmetic applications.

- 79 -

Figures

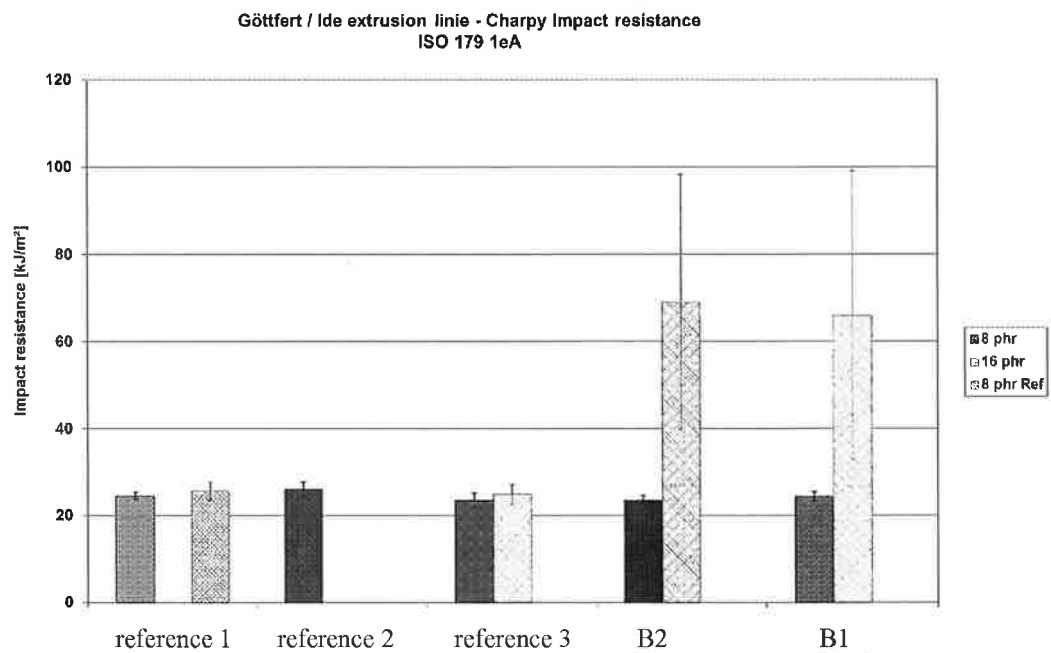


Fig. 1

5



Fig. 2

Fecha: 02.02.17

Solicitud No: 14169923.1 – 1371 / 2949707

Solicitante: OMYA INTERNATIONAL AG

Decisión de conceder una patente europea de conformidad con el Artículo 97(1) EPC

Tras el examen de la solicitud de patente europea Nº 14169923.1, una patente europea con el título y los documentos de soporte indicados en la comunicación de conformidad con la Regla 71(3) EPC (Forma EPO 2004C) o en la información (Forma EPO 2004W, cf. Notificación de la EPO de fecha 8 de junio de 2015, OJ EPO 2015, A52) de 23.09.16 se concede a los Estados contratantes designados.

Patente No. 2949707

Fecha de presentación: 26.05.14

Prioridad reclamada: /

Estados Contratantes Designados y Propietario (s): AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI L T LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

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Esta decisión entrará en vigor en la fecha en que el Boletín Europeo de Patentes menciona la concesión (Artículo 97(3) EPC).

La mención de la concesión se publicará en el Boletín Europeo de Patentes 17/09 de 01.03.17.

División Examinadora

**Claims Allowed for European Application No. 14 169 923.1 – 1375 (EP
2949707)**

1. Crumbles comprising at least one calcium carbonate-containing
5 material, the crumbles
- (a) having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles,
- (b) comprising particles of the at least one calcium carbonate-containing material having a
- 10 i. weight particle size d_{75} of 0.7 to 3.0 μm ,
ii. weight median particle size d_{50} of 0.5 to 2.0 μm ,
iii. weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and
- (c) comprising particles of the at least one calcium carbonate-containing
15 material having a BET specific surface area of from 4.0 to 12.0 m^2/g , measured by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010).
2. The crumbles according to claim 1, wherein the at least one calcium
20 carbonate-containing material is at least one natural calcium carbonate-containing material, preferably dolomite and/or at least one ground calcium carbonate (GCC), more preferably at least one ground calcium carbonate (GCC) and most preferably at least one ground calcium carbonate (GCC) selected from the group comprising marble, chalk, limestone and mixtures thereof.
- 25
3. The crumbles according to claim 1 or 2, wherein the crumbles comprise
- (a) at least one further particulate filler material, preferably at least one further particulate filler material selected from the group comprising
30 precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof, and/or
- 35 (b) on at least a part of the accessible surface area of the calcium carbonate-containing material particles a treatment layer comprising a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or reaction products

- thereof and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent and/or reaction products thereof and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and/or reaction products thereof and one or more phosphoric acid di-ester and/or reaction products thereof.
- 5
4. The crumbles according to any one of claims 1 to 3, wherein the crumbles have
- 10
- (a) a moisture pick up susceptibility such that its total surface moisture level is ≤ 0.6 mg/g, preferably ≤ 0.5 mg/g, more preferably ≤ 0.4 mg/g and most preferably ≤ 0.3 mg/g of the dry crumbles after exposure to an atmosphere of 50% of relative humidity for 48 hours at a temperature of
- 15
- 23°C, and/or
- (b) a moisture content of from 0.2 wt.-% to 0.6 wt.-%, preferably from 0.2 wt.-% to 0.4 wt.-% and most preferably from 0.25 wt.-% to 0.35 wt.-% based on the total dry weight of the crumbles.
- 20
5. Process for the preparation of crumbles comprising at least one calcium carbonate-containing material as defined in any one of claims 1 to 4, the process comprising the steps of:
- (a) providing at least one calcium carbonate-containing material in the form of an aqueous slurry having solids content in the range from 5.0 to 45.0 wt.-%, based on the total weight of the slurry,
- 25
- (b) wet grinding the at least one calcium carbonate-containing material of step a) to obtain an aqueous slurry of the at least one wet-ground calcium carbonate-containing material, wherein the particles of the at least one wet-ground calcium carbonate-containing material have a
- 30
- i. weight particle size d_{75} of 0.7 to 3.0 μm ,
- ii. weight median particle size d_{50} of 0.5 to 2.0 μm ,
- iii. weight particle size d_{25} of 0.1 to 1.0 μm , as measured according to the sedimentation method, and
- iv. a BET specific surface area of from 4.0 to 12.0 m^2/g , measured
- 35
- by nitrogen gas adsorption using the BET isotherm (ISO 9277:2010),
- (c) mechanical dewatering of the aqueous slurry of step b) to obtain crumbles comprising the at least one calcium carbonate-containing

material having solids content of 78.0 wt.-% to 90.0 wt.-%, based on the total weight of the crumbles.

6. The process according to claim 5, wherein the aqueous slurry of the at least one calcium carbonate-containing material of step a) is free of dispersing agents and/or wet-grinding step b) and/or mechanical dewatering step c) is/are carried out in the absence of dispersing agents.
7. The process according to claim 5 or 6, wherein the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) has
- (a) lower solids content than the aqueous slurry of the at least one calcium carbonate-containing material provided in step a), and/or
 - (b) solids content in the range from 10.0 to 35.0 wt.-%, based on the total weight of the slurry.
8. The process according to any one of claims 5 to 7, wherein process step b) is carried out in the presence of at least one further particulate filler material, preferably at least one further particulate filler material selected from the group comprising precipitated calcium carbonate (PCC), metal oxides such as titanium dioxide and/or aluminium trioxide, metal hydroxides such as aluminium tri-hydroxide, metal salts such as sulfates, silicates such as talc and/or kaolin and/or kaolin clay and/or mica, carbonates such as magnesium carbonate and/or gypsum, satin white and mixtures thereof.
9. The process according to any one of claims 5 to 8, wherein the aqueous slurry of the at least one wet-ground calcium carbonate-containing material obtained in step b) is partially dewatered to solids content in the range from 20.0 to 40.0 wt.-%, based on the total weight of the slurry, before process step c) is carried out.
10. The process according to any one of claims 5 to 9, wherein process step c) is carried out under pressure, preferably a pressure from 20.0 bar to 140.0 bar, more preferably from 65.0 bar to 120.0 bar and most preferably from 80.0 to 110.0 bar.

11. The process according to any one of claims 5 to 10, wherein process step c) is carried out in a vertical plate pressure filter, a tube press or a vacuum filter, preferably in a tube press.
- 5 12. The process according to any one of claims 5 to 11, wherein the process further comprises step d) of
- 10 (a) treating the crumbles comprising the at least one calcium carbonate-containing material obtained in step c) with a hydrophobizing agent, preferably an aliphatic carboxylic acid having a total amount of carbon atoms from C4 to C24 and/or at least one mono-substituted succinic anhydride consisting of succinic anhydride mono-substituted with a group selected from a linear, branched, aliphatic and cyclic group having a total amount of carbon atoms from C2 to C30 in the substituent and/or a phosphoric acid ester blend of one or more phosphoric acid mono-ester and one or more phosphoric acid di-ester, to obtain surface-treated crumbles comprising on at least a part of the accessible surface area of the calcium carbonate-containing material particles a treatment layer comprising the hydrophobizing agent, and/or
- 15 (b) drying the crumbles comprising the at least one calcium carbonate-containing material obtained in step c) to solids content of ≥ 97.0 wt.-%, and most preferably from 97.0 to 99.98 wt.-%, based on the total weight of the crumbles, and/or
- 20 (c) dispersing the crumbles by using a polyacrylate-based dispersant.
- 25 13. Article comprising the crumbles comprising at least one calcium carbonate-containing material according to any one of claims 1 to 4.
14. The article of claim 13, wherein the article is selected from the group comprising plastic, food, cosmetic, sealant, pharmaceutical, paper, paper coating, coating, paint, adhesive articles and mixtures thereof.
- 30 15. Use of crumbles comprising at least one calcium carbonate-containing material according to any one of claims 1 to 4 in paper making, paper coating, food, plastic, agricultural, paint, coatings, adhesives, sealants, pharmaceuticals, agricultural, construction and/or cosmetic applications.
- 35

TRADUCCIÓN DE LAS REIVINDICACIONES COMO FUERON OTORGADAS
EN EUROPA SOLICITUD No. 14 169 923.1 – 1375 (EP 2949707)

1. Crumbles que comprenden por lo menos un material que contiene carbonato de calcio, los crumbles se **CARACTERIZAN** porque
 - a) tienen un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, sobre la base del peso total de los crumbles,
 - b) comprenden partículas del por lo menos un material que contiene carbonato de calcio que tienen un
 - i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm ,
 - ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm ,
 - iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm , medido según el método de sedimentación, y
 - c) comprenden partículas del por lo menos un material que contiene carbonato de calcio que tienen un área de superficie específica BET de 4,0 a 12,0 m^2/g , medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010).
2. Los crumbles según la reivindicación 1, **CARACTERIZADOS** porque, el por lo menos un material que contiene carbonato de calcio es por lo menos un material que contiene carbonato de calcio de origen natural, de preferencia dolomita y/o por lo menos un carbonato de calcio molido (GCC), con mayor preferencia por lo menos un carbonato de calcio molido (GCC) y muy preferentemente, por lo menos un carbonato de calcio molido (GCC) elegido entre el grupo que comprende mármol, creta, caliza y mezclas de los mismos.
3. Los crumbles según la reivindicación 1 o 2, **CARACTERIZADOS** porque los crumbles comprenden:
 - a) por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional, elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos tales como dióxido de titanio y/o trióxido de aluminio, hidróxidos metálicos tales como trihidróxido de aluminio, sales metálicas tales como sulfatos, silicatos tales como talco y/o caolín y/o arcilla de caolín y/o mica, carbonatos tales como magnesio, carbonato y/o yeso, blanco satinado y mezclas de los mismos, y/o

- b) en por lo menos una parte del área de superficie accesible de las partículas del material que contiene carbonato de calcio, una capa de tratamiento que comprende un agente hidrofobizante, de preferencia un ácido carboxílico alifático que tiene una cantidad total de átomos de carbono de C₄ a C₂₄ y/o productos de reacción de los mismos y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tiene una cantidad total de átomos de carbono de C₂ a C₃₀ en el substituyente y/o productos de reacción de los mismos y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y/o productos de reacción de los mismos y uno o más diésteres de ácido fosfórico y/o productos de reacción de los mismos.
4. Los crumbles según cualquiera de las reivindicaciones 1 a 3, **CARACTERIZADOS** porque los crumbles tienen
- a) una susceptibilidad de captación de humedad tal, que su nivel de humedad superficial es de $\leq 0,6$ mg/g, de preferencia $\leq 0,5$ mg/g, con mayor preferencia $\leq 0,4$ mg/g y muy preferentemente $\leq 0,3$ mg/g de los crumbles secos después de ser expuestos a una atmósfera de 50 % de humedad relativa durante 48 horas a una temperatura de 23°C, y/o
- b) un contenido de humedad de 0,2 % en peso a 0,6 % en peso, de preferencia de 0,2 % en peso a 0,4 % en peso y muy preferentemente, de 0,25 % en peso a 0,35 % en peso basado en el peso total en seco de los crumbles.
5. Proceso para la preparación de crumbles que comprende por lo menos un material que contiene carbonato de calcio, tal como se define en cualquiera de las reivindicaciones 1 a 4, el proceso se **CARACTERIZA** por comprender los pasos de:
- a) proveer por lo menos un material que contiene carbonato de calcio en la forma de una lechada acuosa que tiene un contenido de sólidos del orden de 5,0 a 45,0 % en peso, basado en el peso total de la lechada,
- b) moler en húmedo el por lo menos un material que contiene carbonato de calcio del paso a) para obtener una lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo, en donde las partículas del por lo menos un material que contiene carbonato de calcio molido húmedo tienen un

- i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm ,
 - ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm ,
 - iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm , medido según el método de sedimentación, y
 - iv) un área de superficie específica BET de 4,0 a 12,0 m^2/g , medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010),
- c) deshidratar mecánicamente la lechada acuosa del paso b) para obtener crumbles que comprenden el por lo menos un material que contiene carbonato de calcio con un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, basado en el peso total de los crumbles.
6. El proceso según la reivindicación 5, **CARACTERIZADO** porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio del paso a) carece de agentes dispersantes, y/o el paso de molienda húmeda paso b) y/o, el paso de deshidratación mecánica c) es/son realizado(s) en ausencia de agentes dispersantes.
7. El proceso según la reivindicación 5 o 6, **CARACTERIZADO** porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) tiene
- a) menor contenido de sólidos que la lechada acuosa del por lo menos un material que contiene carbonato de calcio provisto en el paso a), y/o
 - b) un contenido de sólidos del orden de 10,0 a 35,0 % en peso, basado en el peso total de la lechada.
8. El proceso según cualquiera de las reivindicaciones 5 a 7, **CARACTERIZADO** porque el paso b) del proceso se realiza en presencia de por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos tales como dióxido de titanio y/o trióxido de aluminio, hidróxidos metálicos tales como trihidróxido de aluminio, sales metálicas tales como sulfatos, silicatos tales como talco y/o caolín y/o arcilla de caolín y/o mica, carbonatos tales como carbonato de magnesio y/o yeso, blanco satinado y mezclas de los mismos.

9. El proceso según cualquiera de las reivindicaciones 5 a 8, **CARACTERIZADO** porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) es deshidratada parcialmente hasta un contenido de sólidos del orden de 20,0 a 40,0 % en peso, sobre la base del peso total de la lechada, antes de que se realice el paso c) del proceso.
10. El proceso según cualquiera de las reivindicaciones 5 a 9, **CARACTERIZADO** porque el paso c) del proceso es realizado bajo presión, de preferencia a una presión de 20,0 bares a 140,0 bares, con mayor preferencia de 65,0 bares a 120,0 bares y muy preferentemente, de 80,0 a 110,0 bares.
11. El proceso según cualquiera de las reivindicaciones 5 a 10, **CARACTERIZADO** porque el paso c) del proceso es realizado en un filtro a presión de placa vertical, una prensa de tubo o un filtro de vacío, de preferencia en una prensa de tubo.
12. El proceso según cualquiera de las reivindicaciones 5 a 11, **CARACTERIZADO** porque el proceso comprende adicionalmente el paso d) de
- a) tratar los crumbles que comprenden el por lo menos un material que contiene carbonato de calcio obtenido en el paso c) con un agente hidrofobizante, de preferencia un ácido carboxílico alifático que tenga una cantidad de átomos de carbono de C₄ a C₂₄ y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tenga una cantidad total de átomos de carbono de C₂ a C₃₀ en el substituyente y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y uno o más diésteres de ácido fosfórico, para obtener crumbles de superficie tratada que comprenden sobre, por lo menos en una parte del área de superficie accesible de las partículas del material que contiene carbonato de calcio, una capa de tratamiento que comprende el agente hidrofobizante, y/o
 - b) secar los crumbles que comprenden el por lo menos un material que contiene carbonato de calcio obtenido en el paso c) hasta un contenido

de sólidos de $\geq 97,0$ % en peso, y muy preferentemente de 97,0 a 99,98 % en peso, sobre la base del peso total de los crumbles, y/o

c) dispersar los crumbles usando un dispersante a base de poliacrilato.

13. Artículo **CARACTERIZADO** porque comprende los crumbles que comprenden por lo menos un material que contiene carbonato de calcio según cualquiera de las reivindicaciones 1 a 4.

14. El artículo de la reivindicación 13, **CARACTERIZADO** porque el artículo es elegido entre el grupo que comprende plástico, alimentos, artículos cosméticos, sellantes, farmacéuticos, papel, estucados de papel, artículos de recubrimiento, pintura, adhesivos y mezclas de los mismos.

15. Uso de crumbles que comprenden por lo menos un material que contiene carbonato de calcio según cualquiera de reivindicaciones 1 a 4, **CARACTERIZADO** por su empleo en la fabricación de papel, estucado de papel, alimento, plástico, en aplicaciones agrícolas, pintura, recubrimientos, adhesivos, sellantes, productos farmacéuticos, agrícolas, construcción y/o cosmética.



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Application No. 14 169 923.1 - 1375 ✓	Ref. O 9851 / HG ✓	Date 23.03.2016
Applicant Omya International AG ✓		

Communication pursuant to Article 94(3) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(2) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 126(2) and 131(2) and (4) EPC. One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (R. 50(1) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Art. 94(4) EPC).



Siebel, Eric
Primary Examiner
For the Examining Division

Enclosure(s): 3 page/s reasons (Form 2906)

The examination is being carried out on the **following application documents**

Description, Pages

1-72 as originally filed

Claims, Numbers

1-15 as originally filed

Drawings, Sheets

1 as originally filed

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

- D1 WO 2009/009553 A1 (IMERYS PIGMENTS INC [US]; LYONS ANTHONY V [US]; YUAN JUN [US]) 15 January 2009 (2009-01-15)
- D2 EP 2 194 103 A1 (OMYA DEVELOPMENT AG [CH]) 9 June 2010 (2010-06-09)
- D3 WO 2004/016566 A1 (HUBER CORP J M [US]) 26 February 2004 (2004-02-26)

- 1.1 Document D1 discloses a method for preparing PCC having a defined particle size distribution in which a slurry of freshly prepared PCC undergoes at least one further treatment, for example, at least one of dewatering, grinding and screening. According to D1 crumbs of PCC having a particle size d50 of 0.56-0.99 microns, d30 of 0.41-0.67 microns and d70 of 0.68-1.38 microns with a BET surface ranging from 6.7-10.2 m²/g are obtained (see D1 p6 line 1-3; table 1, sample PCC 4, PCC 5, table 2 PCC 10, PCC 11, PCC 12, PCC 13).
- 1.2 The subject matter of claim 1 differs from this known PCC, in that crumbs have a solid content of 78.0 to 90 wt.-% based on the total weight of the crumbs, the crumbles comprising particles of at least one calcium carbonate material having the characteristics shown in i) to iii) and a BET surface of 4.0 to 12 m²/g.

- 1.3 The subject-matter of claim 1 is new (Art. 54(1) and (2) EPC).
- 1.4 Document D2 discloses the preparation of a natural ground calcium carbonate from Norway with a d50 of 0.8 micron. The mineral is wet ground at 20 weight % solids in tap water in a vertical attritor mill (Dynomill(TM)) in a recirculation mode without adding additives, such as dispersing and/or grinding aids to a fineness till 60 weight% of the particle having a diameter <1 micron. After grinding the product has a median diameter d50 of 0.8 micron. After grinding the slurry is concentrated by a tube press to form crumbles of 80 - 83 weight% solids (see D2, [0105]-[0108]).
- 1.5 The subject-matter of claim 1 differs from this known crumbs, in that the crumbs comprise at least one calcium carbonate particle material having a BET specific surface of 4.0 to 12.0 m²/g.
- 1.6 The subject-matter of claim 1 is new in the sense of Art. 54(1) and (2) EPC.
- 2 Document D3 discloses a fine, aggregated scalenohedral PCC present in a slurry with 18.3 wt.-% solids, which have a median particle size of 1.78 microns and a BET specific surface of 11.1 m²/g. The slurry dewatered into crumbs on a filter press, after which the solids were 57% (see D3, [0023]-[0024], table II).
- 2.1 The subject-matter of claim 1 differs from this known crumbs in that the crumbs have a solid content of 78.0-90.0 wt-% and the calcium carbonate particles have a d75 of 0.7 to 3.0 microns and a d25 of 0.1 to 1.0 microns.
- 2.2 The subject-matter of claim 1 is new in the sense of Art. 54(1) and (2) EPC.
- 3 Document D2 solves the problem of providing a calcium carbonate material having a particle surface with improved adsorption properties of dispersants for high stability suspensions (see D2, [0010]).
- 3.1 Document D3 solves the problem of providing calcium carbonate materials that impart effective light-scattering, gloss and opacity performance to paper (see D3, [0005]).
- 3.2 D2 is chosen as closest prior art, as it has most features in common with present claim 1.
- 3.3 In view of the distinguishing feature, no special technical effect has been shown in the application.
- In the absence of such evidence, the problem underlying the application in view of the distinguishing feature can only be regarded as providing alternative crumbs comprising at least one calcium carbonate containing material.

3.4 The solution proposed in claim 1 is considered to comprise an inventive step in the sense of Art. 56 EPC for the following reason:

3.5 The cited prior art does not disclose or even remotely suggest the solution proposed in claim 1.

4 The applicant should deal with the following :

4.1 To meet the requirements of Rule 42(1)(b) EPC, the documents D1, D2 and D3 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

4.2 On page 77, line 10 (part b) of claim 12) there seems to be a typing error: instead of "comprisingt theat least one.." it should be " comprising the at least one..."

4.3 The applicant is requested to effect the amendments by filing replacement pages for only those pages which have been amended. Unnecessary recasting of the description should be avoided. An amended abstract is not required. The applicant should also take account of the requirements of Rule 50(1) EPC. The applicant is reminded that with effect from 1 January 2014, the EPO will discontinue its existing practice and, in strict compliance with Rule 50(1) EPC in conjunction with Rule 49(8) EPC, will no longer accept handwritten amendments in documents replacing parts of the European patent application. Rule 49(8), second sentence, EPC is not affected (see GL A-III, 3.2; A-VIII, 2.1; see also H-III, 2.3 (September 2013 edition) and Official Journal 12/2013, page 603).

Europäisches Patentamt

80298 München

Munich, 21 June 2016

Official Ref.: EP 14 169 923.1-1375 / 2 949 707
Applicant: OMYA INTERNATIONAL AG

Our Ref.: O 9851 / HG

In response to the Communication pursuant to Art. 94(3) EPC dated
23 March 2016, the following submission is made on behalf of the applicant:

In the Communication, it is merely requested to correct a typing error in
claim 12 as originally filed and to identify and to discuss cited documents
D1 to D3 in the description.

In response thereto, a new set of claims 1 to 15 is filed herewith. New claim
12 has been amended in that the wording “*comprising the at least one...*” has
been replaced with “*comprising the at least one...*”. Support for this
amendment can be found on e.g. page 50, lines 26 to 29 of the application as
filed. Furthermore, the preferred solids content, i.e. the wording “*preferably
from 97.0 to 99.98 wt.-%*”, is mentioned twice and thus has been deleted
from new claim 12.

HG:MJ:ajo

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Kooperation mit

Maiwald Patentanwalts-gesellschaft
(Schweiz) mbH, Zürich

TPL Rechtsanwälte Tauche, Leutheusser-
Schnarrenberger*, München, Starnberg

Furthermore, a description adapted to the new claims and, further, making reference to documents D1 to D3 is filed herewith.

It is assumed that the patent application now fulfils the requirements of the EPC and it is kindly requested to issue the Communication under Rule 71(3) EPC.

In the unexpected case that any further objections arise, the issuance of further a Communication under Article 94(3) EPC is kindly requested. As an auxiliary measure, oral proceedings are requested before any decision is taken other than the grant of the patent.



Maiwald Patentanwalts GmbH
- Association No. 174 -
(Melanie Boos)

Encls.:

New claims 1 to 15 (track-change
and clean version)

Adapted description (track-change
and clean version)

Fecha: 23.03.2016

Solicitud No. 14 169 923.1

El examen se lleva a cabo en relación con los **siguientes documentos de la solicitud**

Descripción, Páginas

1-72 según fueron publicadas

Reivindicaciones, Números

1-15 según fueron publicadas

Dibujos, Hojas

1 según fueron publicados

Se hace referencia a los siguientes documentos; la numeración se cumplirá en el resto del procedimiento.

- D1 WO 2009/009553 A1 (IMERYS PIGMENTS INC [US]; LYONS ANTHONY V [US]; YUAN JUN [US]) 15 de enero de 2009 (2009-01-15)
- D2 EP 2 194 103 A1 (OMYA DEVELOPMENT AG [CH]) 9 de junio de 2010 (2010-06-09)
- D3 WO 2004/016566 A1 (HUBER CORP J M [US]) 26 de febrero de 2004 (2004-02-26)

- 1.1 El documento D1 da a conocer un método de preparación PCC que tiene una distribución de tamaño de partícula definida en la que una lechada de PCC recién preparada experimenta al menos un tratamiento adicional, por ejemplo, al menos uno de deshidratación, molido y cribado. De acuerdo con D1, crumbs de PCC que tienen un tamaño de partícula d50 de 0,56-0,99 micrómetros, d30 de 0,41-0,67 micrómetros y d70 de 0,68-1,38 micrómetros con una superficie BET de 6,7-10,2 m²/g son obtenidas (véase D1 p6, línea 1 -3, tabla 1, muestra PCC 4, PCC 5, tabla 2 PCC 1 O, PCC 11, PCC 12, PCC 13).
- 1.2 El objeto de la reivindicación 1 difiere de este PCC conocido, en que los crumbs tienen un contenido de sólidos de 78,0 a 90% en peso basado en el peso total de los crumbs, comprendiendo los crumbs partículas de al menos un material de carbonato cálcico que tiene las características mostradas en i) a iii) y una superficie BET de 4,0 a 12 m²/g.

- 1.3 El objeto de la reivindicación 1 es nueva (Art. 54(1) y (2) EPC).
- 1.4 El documento D2 describe la preparación de un carbonato de calcio molido de origen natural de Noruega con una d50 de 0,8 micrómetros. El mineral se moja a 20% en peso de sólidos en agua de grifo en un agitador vertical (Dynomill™) en un modo de recirculación sin adición de aditivos, tales como auxiliares de dispersión y/o molienda hasta una pureza de hasta el 60% en peso de la partícula con un diámetro < 1 micrómetro. Después de triturar el producto tiene un diámetro medio d50 de 0,8 micrómetros. Después de triturar la lechada se concentra por una prensa de tubo para formar crumbles de 80 - 83% en peso de sólidos (véase D2, [0105]-[0108]).
- 1.5 El objeto de la reivindicación 1 difiere de estos crumbles conocidos, porque los crumbs comprenden al menos un material de partículas de carbonato cálcico que tiene una superficie específica BET de 4,0 a 12,0 m²/g.
- 1.6 El objeto de la reivindicación 1 es nueva a la luz del Art. 54(1) y (2) EPC.
- 2 El documento D3 describe un PCC escalenoédrico agregado fino presente en una lechada con 18,3% en peso de sólidos, que tienen un tamaño de partícula medio de 1,78 micrómetros y una superficie específica BET de 11,1 m²/g. La lechada se deshidrató en crumbs en un filtro prensa, después de lo cual los sólidos fueron 57% (véase D3, [0023]-[0024], tabla II). El objeto de la reivindicación 1 difiere de estos crumbles conocidos en que los crumbs tienen un contenido de sólidos de 78,0-90,0% en peso y las partículas de carbonato de calcio tienen una d75 de 0,7 a 3,0 micrómetros y una d25 de 0,1 a 1,0 micrómetros.
- 2.2 El objeto de la reivindicación 1 es nueva a la luz del Art. 54(1) y (2) EPC.
- 3 El documento D2 soluciona el problema de proporcionar un material de carbonato cálcico que tiene una superficie de partícula con propiedades de adsorción mejoradas de dispersantes para suspensiones de alta estabilidad (véase D2, [0010]). El documento D3 soluciona el problema de proporcionar materiales de carbonato de calcio que imparten un rendimiento eficaz de dispersión de la luz, brillo y opacidad al papel (véase D3, [0005]).
- 3.2 D2 se elige como la técnica anterior más cercana, ya que tiene más características en común con la presente reivindicación 1.
- 3.3 En vista de la característica distintiva, no se ha demostrado ningún efecto técnico específico en la solicitud.
- En ausencia de tales pruebas, el problema subyacente a la solicitud en vista de la característica distintiva sólo puede considerarse como proporcionar crumbs alternativos que comprendan al menos un material que contiene carbonato de calcio.

- 3.4 Se considera que la solución propuesta en la reivindicación 1 comprende una actividad inventiva en el sentido del Artículo 56 EPC por la siguiente razón:
- 3.5 La técnica anterior citada no revela ni siquiera sugiere remotamente la solución propuesta en la reivindicación 1.
- 4 El solicitante debe tratar de lo siguiente: Para cumplir con los requisitos de la Regla 42(1)(b) de la EPC, los documentos D1, D2 y D3 deben ser identificados en la descripción y el arte de fondo relevante divulgado en ella debe ser discutido brevemente.
- 4.2 En la página 77, línea 10 (parte b) de la reivindicación 12) parece que hay un error de mecanografía: en lugar de “comprender al menos uno ...” debe ser “que comprende al menos uno ...”
- 4.3 Se pide al solicitante que efectúe las modificaciones presentando páginas de reemplazo con sólo las páginas que han sido modificadas. Debe evitarse la reformulación innecesaria de la descripción. No se requiere un resumen modificado. El solicitante también debe tener en cuenta los requisitos de la Regla 50(1) EPC. Se recuerda al solicitante que, con efecto a partir del 1 de enero de 2014, la EPO suspenderá su práctica actual y, en estricto cumplimiento de la Regla 50(1) EPC en relación con la Regla 49(8) EPC, ya no se aceptarán modificaciones manuscritas en documentos que sustituyan partes de la solicitud de patente europea. La Regla 49(8), segunda oración, EPC no se ve afectada (véase GL A-III, 3.2, A-VIII 2.1; véase también H-III, 2.3 (edición de septiembre de 2013) y Diario Oficial 12/2013, página 603).

Formato EPO 2906 01.91 TRI

Munich, 21 de junio de 2016

Ref. Oficial: EP 14 169 923.1-1375 / 2 949 707

Solicitante: OMYA INTERNATIONAL AG

Nuestra Ref.: O 9851 / HG

En respuesta a la Comunicación de conformidad con el Art. 94(3) EPC de fecha 23 de marzo de 2016, se hace la siguiente presentación en nombre del solicitante:

En la Comunicación se solicita simplemente corregir un error de mecanografía en la reivindicación 12 tal como se presentó originalmente e identificar y debatir los documentos citados D1 a D3 en la descripción.

En respuesta a ello, se presenta un nuevo conjunto de las reivindicaciones 1 a 15. La nueva reivindicación 12 ha sido modificada en el sentido de que la expresión "*comprender al menos uno ...*" ha sido sustituida por "*que comprende al menos uno ...*". El apoyo a esta modificación se puede encontrar en, por ejemplo, página 50, líneas 26 a 29 de la solicitud tal como fue presentada. Además, el contenido de sólidos preferido, es decir, la expresión "*preferiblemente de 97,0 a 99,98% en peso*", se menciona dos veces y, por lo tanto, se ha suprimido de la nueva reivindicación 12.

Además, se presenta una descripción adaptada a las nuevas reivindicaciones y, además, haciendo referencia a los documentos D1 a D3.

Se asume que la solicitud de patente cumple ahora los requisitos del EPC y amablemente se solicita que se emita la Comunicación bajo la Regla 71(3) EPC.

En el caso inesperado de que surjan nuevas objeciones, se solicita amablemente la emisión de una comunicación bajo el Artículo 94(3) EPC. Como medida auxiliar, se solicita un procedimiento oral antes de adoptar cualquier decisión que no sea la concesión de la patente.

(Firma ilegible)

Maiwald Patentanwalts GmbH

Asociación No. 174

(Melanie Boos)

Questions about this communication ?
Contact Customer Services at www.epo.org/contact



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MAIWALD Patentanwalts GmbH		
2 5. Nov. 2014		
MÜNCHEN		
FRIST		

Date	20.11.14
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Reference O 9851 / HG ✓	Application No./Patent No. 14169923.1 - 1355 ✓
Applicant/Proprietor Omya International AG ✓	

Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the European search report (R. 61 EPC) or the partial European search report/ declaration of no search (R. 63 EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☒ 0 additional set(s) of copies of such documents is (are) enclosed as well.

The following have been approved:

☒ Abstract ☐ Title

☐ The Abstract was modified and the definitive text is attached to this communication.

The following figure(s) will be published together with the abstract: 1

Refund of search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Should you wish to further prosecute this application in the examination phase, your attention is drawn to the provisions of Rule 70a EPC. An invitation to respond to the extended European search report will be issued once the date of publication of the European search report has been mentioned in the European Patent Bulletin (R. 69(1), R. 70(2) EPC).



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2009/009553 A1 (IMERYS PIGMENTS INC [US]; LYONS ANTHONY V [US]; YUAN JUN [US]) 15 January 2009 (2009-01-15) * page 6, line 1 - line 3; tables 1,2 *	1-15	INV. C09C1/02 C08K3/00 C01F11/18
A	EP 2 194 103 A1 (OMYA DEVELOPMENT AG [CH]) 9 June 2010 (2010-06-09) * paragraph [0105] - paragraph [0108] *	1-15	
A	WO 2004/016566 A1 (HUBER CORP J M [US]) 26 February 2004 (2004-02-26) * paragraph [0023] - paragraph [0024]; tables 1,2 *	1-15	
A	GB 2 139 606 A (PLUSS STAUFFER AG) 14 November 1984 (1984-11-14) * claims 1-9 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			C09C C08K C01F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 November 2014	Examiner Siebel, Eric
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 16 9923

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-11-2014

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2009009553	A1	15-01-2009	NONE	
EP 2194103	A1	09-06-2010	CA 2744927 A1	10-06-2010
			CN 102264847 A	30-11-2011
			DK 2373746 T3	23-09-2013
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			HR P20130818 T1	08-11-2013
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			PT 2373746 E	24-09-2013
			RU 2011127182 A	10-01-2013
			SI 2373746 T1	29-11-2013
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			WO 2010063757 A1	10-06-2010
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			WO 2004016566 A1	26-02-2004
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			AU 558632 B2	05-02-1987
			AU 2093083 A	15-11-1984
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			CA 1219730 A1	31-03-1987
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			ES 8602544 A1	16-03-1986
			FI 832279 A	10-11-1984
			FR 2545812 A1	16-11-1984
			GB 2139606 A	14-11-1984
			IT 1172304 B	18-06-1987
			JP H0259181 B2	11-12-1990
			JP S59204662 A	20-11-1984
			NL 8302549 A	03-12-1984
			NO 832355 A	12-11-1984

Application No.:

14 169 923.1

The application and the invention to which it relates seem to meet the requirements of the EPC. Upon presence of a valid request for examination and consideration by the examining division, a communication under Rule 71(3) EPC may be issued.

The further procedure with respect to this application is dependent upon the result of the search for prior art under Article 54(3) EPC* which will be carried out at least 18 months from the date of filing of the application under consideration. If such prior art is found, a communication under Rule 71(1) EPC will be sent. The communication under Rule 71(3) EPC can be issued only after that search has been carried out and if no such prior art is found.

* It is to be noted that Article 54(4) EPC 1973 continues to apply to European patent applications still pending, filed before 13.12.2007

6	TABLA DE CORRESPONDENCIA DE REIVINDICACIONES		
	Reivindicaciones en la solicitud en Colombia (NOTA. LAS REIVINDICACIONES ACÁ INDICADAS CORRESPONDEN A AQUELLAS MODIFICADAS EN RESPUESTA AO No. 14155 RADICADO EL 05.04.2017)	Reivindicaciones otorgables en la solicitud internacional	Explicación sobre la suficiente correspondencia ó Comentarios que explican la correspondencia
1.	Crumbles que comprenden un material que contiene carbonato de calcio, los crumbles se CARACTERIZAN porque a) tienen un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, sobre la base del peso total de los crumbles, b) comprenden partículas que tienen un i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm, ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm, iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm, medido según el método de sedimentación, y c) comprenden partículas que tienen un área de superficie específica BET de 4,0 a 12,0 m^2/g, medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010).	1. Crumbles que comprenden por lo menos un material que contiene carbonato de calcio, los crumbles se CARACTERIZAN porque a) tienen un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, sobre la base del peso total de los crumbles, b) comprenden partículas del por lo menos un material que contiene carbonato de calcio que tienen un i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm, ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm, iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm, medido según el método de sedimentación, y c) comprenden partículas del por lo menos un material que contiene carbonato de calcio que tienen un área de superficie específica BET de 4,0 a 12,0 m^2/g, medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010).	Esta reivindicación fue modificada con el fin de: - Eliminar el término ambiguo “por lo menos”. - Eliminar la expresión “un material que contiene carbonato de calcio” de los ítems b) y c).
2.	Los crumbles según la reivindicación 1, CARACTERIZADOS porque, dicho material que contiene carbonato de calcio es por lo menos un material que contiene carbonato de calcio de origen natural seleccionado de dolomita, mármol, creta, caliza y mezclas de los mismos.	2. Los crumbles según la reivindicación 1, CARACTERIZADOS porque, el por lo menos un material que contiene carbonato de calcio es por lo menos un material que contiene carbonato de calcio de origen natural, de preferencia dolomita y/o por lo menos un carbonato de calcio molido (GCC), con mayor preferencia por lo menos un carbonato de calcio molido (GCC) y muy preferentemente, por lo menos un carbonato de calcio molido (GCC) elegido entre el grupo que comprende mármol, creta, caliza y mezclas de los mismos.	Esta reivindicación fue modificada con el fin de: - Eliminar el término ambiguo “por lo menos”. - Mejorar la claridad de la reivindicación. - Eliminar los términos “de preferencia” y “con mayor preferencia”.
3.	Los crumbles según la reivindicación 1 o 2, CARACTERIZADOS porque los crumbles comprenden: a) por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional, elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos, hidróxidos metálicos, sales metálicas, silicatos, carbonatos y mezclas de los mismos, y/o b) en por lo menos una parte del área de superficie accesible de las partículas del material que contiene	3. Los crumbles según la reivindicación 1 o 2, CARACTERIZADOS porque los crumbles comprenden: a) por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional, elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos tales como dióxido de titanio y/o trióxido de aluminio, hidróxidos metálicos tales como trihidróxido de aluminio, sales metálicas tales como sulfatos, silicatos tales como talco y/o caolín y/o arcilla de caolín y/o mica, carbonatos tales como	Esta reivindicación fue modificada con el fin de eliminar algunos de los compuestos que actúan como “material de relleno particulado”.

carbonato de calcio, una capa de tratamiento que comprende un agente hidrofobizante, de preferencia un ácido carboxílico alifático que tiene una cantidad total de átomos de carbono de C₄ a C₂₄ y/o productos de reacción de los mismos y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tiene una cantidad total de átomos de carbono de C₂ a C₃₀ en el substituyente y/o productos de reacción de los mismos y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y/o productos de reacción de los mismos y uno o más diésteres de ácido fosfórico y/o productos de reacción de los mismos.	magnesio, carbonato y/o yeso, blanco satinado y mezclas de los mismos, y/o b) en por lo menos una parte del área de superficie accesible de las partículas del material que contiene carbonato de calcio, una capa de tratamiento que comprende un agente hidrofobizante, de preferencia un ácido carboxílico alifático que tiene una cantidad total de átomos de carbono de C₄ a C₂₄ y/o productos de reacción de los mismos y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tiene una cantidad total de átomos de carbono de C₂ a C₃₀ en el substituyente y/o productos de reacción de los mismos y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y/o productos de reacción de los mismos y uno o más diésteres de ácido fosfórico y/o productos de reacción de los mismos.	
4. Los crumbles según cualquiera de las reivindicaciones 1 a 3, CARACTERIZADOS porque los crumbles tienen a) una susceptibilidad de captación de humedad tal, que su nivel de humedad superficial es de $\leq 0,6$ mg/g de los crumbles secos después de ser expuestos a una atmósfera de 50 % de humedad relativa durante 48 horas a una temperatura de 23°C, y/o b) un contenido de humedad de 0,2 % en peso a 0,6 % en peso basado en el peso total en seco de los crumbles.	4. Los crumbles según cualquiera de las reivindicaciones 1 a 3, CARACTERIZADOS porque los crumbles tienen a) una susceptibilidad de captación de humedad tal, que su nivel de humedad superficial es de $\leq 0,6$ mg/g, de preferencia $\leq 0,5$ mg/g, con mayor preferencia $\leq 0,4$ mg/g y muy preferentemente $\leq 0,3$ mg/g de los crumbles secos después de ser expuestos a una atmósfera de 50 % de humedad relativa durante 48 horas a una temperatura de 23°C, y/o b) un contenido de humedad de 0,2 % en peso a 0,6 % en peso, de preferencia de 0,2 % en peso a 0,4 % en peso y muy preferentemente, de 0,25 % en peso a 0,35 % en peso basado en el peso total en seco de los crumbles.	<i>Esta reivindicación fue modificada con el fin de eliminar las expresiones “de preferencia $\leq 0,5$ mg/g, con mayor preferencia $\leq 0,4$ mg/g y muy preferentemente $\leq 0,3$ mg/g” y “de preferencia de 0,2 % en peso a 0,4 % en peso y muy preferentemente, de 0,25 % en peso a 0,35 % en peso”.</i>
5. Proceso para la preparación de crumbles que comprende por lo menos un material que contiene carbonato de calcio, tal como se define en cualquiera de las reivindicaciones 1 a 4, el proceso se CARACTERIZA por comprender los pasos de: a) proveer por lo menos un material que contiene carbonato de calcio en la forma de una lechada acuosa que tiene un contenido de sólidos del orden de 5,0 a 45,0 % en peso, sobre la base del peso total de la lechada, b) moler en húmedo el por lo menos un material que contiene carbonato de calcio del paso a) para obtener una lechada acuosa del por lo menos un material que	5. Proceso para la preparación de crumbles que comprende por lo menos un material que contiene carbonato de calcio, tal como se define en cualquiera de las reivindicaciones 1 a 4, el proceso se CARACTERIZA por comprender los pasos de: a) proveer por lo menos un material que contiene carbonato de calcio en la forma de una lechada acuosa que tiene un contenido de sólidos del orden de 5,0 a 45,0 % en peso, basado en el peso total de la lechada, b) moler en húmedo el por lo menos un material que contiene carbonato de calcio del paso a) para obtener una lechada acuosa del por lo menos un material que	<i>Es la misma reivindicación</i>

contiene carbonato de calcio molido húmedo, en donde las partículas del por lo menos un material que contiene carbonato de calcio molido húmedo tienen un i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm, ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm, iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm, medido según el método de sedimentación, y iv) un área de superficie específica BET de 4,0 a 12,0 m^2/g, medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010), c) deshidratar mecánicamente la lechada acuosa del paso b) para obtener crumbles que comprenden el por lo menos un material que contiene carbonato de calcio con un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, sobre la base del peso total de los crumbles.	contiene carbonato de calcio molido húmedo, en donde las partículas del por lo menos un material que contiene carbonato de calcio molido húmedo tienen un i) tamaño de partícula de peso d_{75} de 0,7 a 3,0 μm, ii) tamaño de partícula medio de peso d_{50} de 0,5 a 2,0 μm, iii) tamaño de partícula de peso d_{25} de 0,1 a 1,0 μm, medido según el método de sedimentación, y iv) un área de superficie específica BET de 4,0 a 12,0 m^2/g, medida por adsorción de gas de nitrógeno usando la isoterma BET (ISO 9277:2010), c) deshidratar mecánicamente la lechada acuosa del paso b) para obtener crumbles que comprenden el por lo menos un material que contiene carbonato de calcio con un contenido de sólidos de 78,0 % en peso a 90,0 % en peso, basado en el peso total de los crumbles.	
6. El proceso según la reivindicación 5, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio del paso a) carece de agentes dispersantes, y/o el paso de molienda húmeda paso b) y/o, el paso de deshidratación mecánica c) es/son realizado(s) en ausencia de agentes dispersantes.	6. El proceso según la reivindicación 5, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio del paso a) carece de agentes dispersantes, y/o el paso de molienda húmeda paso b) y/o, el paso de deshidratación mecánica c) es/son realizado(s) en ausencia de agentes dispersantes.	<i>Es la misma reivindicación</i>
7. El proceso según la reivindicación 5 o 6, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) tiene a) menor contenido de sólidos que la lechada acuosa del por lo menos un material que contiene carbonato de calcio provisto en el paso a), y/o b) un contenido de sólidos del orden de 10,0 a 35,0 % en peso, sobre la base del peso total de la lechada.	7. El proceso según la reivindicación 5 o 6, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) tiene a) menor contenido de sólidos que la lechada acuosa del por lo menos un material que contiene carbonato de calcio provisto en el paso a), y/o b) un contenido de sólidos del orden de 10,0 a 35,0 % en peso, basado en el peso total de la lechada.	<i>Es la misma reivindicación</i>
8. El proceso según cualquiera de las reivindicaciones 5 a 7, CARACTERIZADO porque el paso b) del proceso se realiza en presencia de por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos tales como dióxido de titanio y/o trióxido de aluminio, hidróxidos metálicos tales como trihidróxido de aluminio, sales metálicas tales como sulfatos, silicatos tales como talco y/o caolín y/o arcilla de caolín y/o mica, carbonatos tales como carbonato de	8. El proceso según cualquiera de las reivindicaciones 5 a 7, CARACTERIZADO porque el paso b) del proceso se realiza en presencia de por lo menos un material de relleno particulado, adicional, de preferencia por lo menos un material de relleno particulado adicional elegido entre el grupo que comprende carbonato de calcio precipitado (PCC), óxidos metálicos tales como dióxido de titanio y/o trióxido de aluminio, hidróxidos metálicos tales como trihidróxido de aluminio, sales metálicas tales como sulfatos, silicatos tales como talco y/o caolín y/o arcilla de caolín y/o mica, carbonatos tales como carbonato de	<i>Es la misma reivindicación</i>

magnesio y/o yeso, blanco satinado y mezclas de los mismos.	magnesio y/o yeso, blanco satinado y mezclas de los mismos.	
9. El proceso según cualquiera de las reivindicaciones 5 a 8, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) es deshidratada parcialmente hasta un contenido de sólidos del orden de 20,0 a 40,0 % en peso, sobre la base del peso total de la lechada, antes de que se realice el paso c) del proceso.	9. El proceso según cualquiera de las reivindicaciones 5 a 8, CARACTERIZADO porque la lechada acuosa del por lo menos un material que contiene carbonato de calcio molido húmedo obtenido en el paso b) es deshidratada parcialmente hasta un contenido de sólidos del orden de 20,0 a 40,0 % en peso, sobre la base del peso total de la lechada, antes de que se realice el paso c) del proceso.	<i>Es la misma reivindicación</i>
10. El proceso según cualquiera de las reivindicaciones 5 a 9, CARACTERIZADO porque el paso c) del proceso es realizado bajo presión.	10. El proceso según cualquiera de las reivindicaciones 5 a 9, CARACTERIZADO porque el paso c) del proceso es realizado bajo presión, de preferencia a una presión de 20,0 bares a 140,0 bares, con mayor preferencia de 65,0 bares a 120,0 bares y muy preferentemente, de 80,0 a 110,0 bares.	<i>Esta reivindicación fue dividida en dos reivindicaciones (10 y 11 de la solicitud colombiana) con el fin de incluir en una reivindicación adicional las características preferentes u opcionales dadas por la expresión “de preferencia”.</i> <i>Las características opcionales dadas en la expresión “con mayor preferencia de 65,0 bares a 120,0 bares y muy preferentemente, de 80,0 a 110,0 bares” fueron eliminadas en la solicitud colombiana.</i>
11. El proceso según la reivindicación 10, CARACTERIZADO porque la presión es de 20,0 bares a 140,0 bares.		
12. El proceso según cualquiera de las reivindicaciones 5 a 11, CARACTERIZADO porque el paso c) del proceso es realizado en un filtro a presión de placa vertical, una prensa de tubo o un filtro de vacío.	11. El proceso según cualquiera de las reivindicaciones 5 a 10, CARACTERIZADO porque el paso c) del proceso es realizado en un filtro a presión de placa vertical, una prensa de tubo o un filtro de vacío, de preferencia en una prensa de tubo.	<i>Esta reivindicación fue modificada con el fin de eliminar la característica opcional dada por la expresión “de preferencia”.</i>
13. El proceso según cualquiera de las reivindicaciones 5 a 12, CARACTERIZADO porque el proceso comprende adicionalmente el paso d) de a) tratar los crumbles que comprenden el por lo menos un material que contiene carbonato de calcio obtenido en el paso c) con un agente hidrofobizante para obtener crumbles de superficie tratada que comprenden sobre el área de superficie accesible de las partículas del material que contiene carbonato de calcio, una capa de tratamiento que comprende el agente hidrofobizante, y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tenga una cantidad total de átomos de carbono de C ₂ a C ₃₀ en el sustituyente y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y uno o más diésteres de ácido fosfórico, y/o b) secar los crumbles que comprenden el por lo menos	12. El proceso según cualquiera de las reivindicaciones 5 a 11, CARACTERIZADO porque el proceso comprende adicionalmente el paso d) de a) tratar los crumbles que comprenden el por lo menos un material que contiene carbonato de calcio obtenido en el paso c) con un agente hidrofobizante, de preferencia un ácido carboxílico alifático que tenga una cantidad de átomos de carbono de C ₄ a C ₂₄ y/o por lo menos un anhídrido succínico mono-substituido constituido por anhídrido succínico mono-substituido con un grupo elegido entre un grupo alifático lineal, ramificado y cíclico, que tenga una cantidad total de átomos de carbono de C ₂ a C ₃₀ en el sustituyente y/o una mezcla de ésteres de ácido fosfórico de uno o más monoésteres de ácido fosfórico y uno o más diésteres de ácido fosfórico, para obtener crumbles de superficie tratada que comprenden sobre, por lo menos en una parte del área de superficie accesible de las partículas del material que contiene carbonato de calcio, una capa de tratamiento que comprende el	<i>Esta reivindicación fue modificada con el fin de eliminar las expresiones “por lo menos en una parte del”, “de preferencia un ácido carboxílico alifático que tenga una cantidad de átomos de carbono de C₄ a C₂₄” y “, y muy preferentemente de 97,0 a 99,98 % en peso”.</i>

un material que contiene carbonato de calcio obtenido en el paso c) hasta un contenido de sólidos de $\geq 97,0$ % en peso, sobre la base del peso total de los crumbles, y/o c) dispersar los crumbles usando un dispersante a base de poliacrilato.	agente hidrofobizante, y/o b) secar los crumbles que comprenden el por lo menos un material que contiene carbonato de calcio obtenido en el paso c) hasta un contenido de sólidos de $\geq 97,0$ % en peso, y muy preferentemente de 97,0 a 99,98 % en peso, sobre la base del peso total de los crumbles, y/o c) dispersar los crumbles usando un dispersante a base de poliacrilato.	
14. Artículo CARACTERIZADO porque comprende los crumbles que comprenden por lo menos un material que contiene carbonato de calcio según cualquiera de las reivindicaciones 1 a 4.	13. Artículo CARACTERIZADO porque comprende los crumbles que comprenden por lo menos un material que contiene carbonato de calcio según cualquiera de las reivindicaciones 1 a 4.	<i>Es la misma reivindicación</i>
15. El artículo de la reivindicación 14, CARACTERIZADO porque el artículo es elegido entre el grupo que comprende plástico.	14. El artículo de la reivindicación 13, CARACTERIZADO porque el artículo es elegido entre el grupo que comprende plástico, alimentos, artículos cosméticos, sellantes, farmacéuticos, papel, estucados de papel, artículos de recubrimiento, pintura, adhesivos y mezclas de los mismos.	<i>Esta reivindicación fue modificada con el fin de restringir la materia divulgada.</i>
	15. Uso de crumbles que comprenden por lo menos un material que contiene carbonato de calcio según cualquiera de reivindicaciones 1 a 4, CARACTERIZADO por su empleo en la fabricación de papel, estucado de papel, alimento, plástico, en aplicaciones agrícolas, pintura, recubrimientos, adhesivos, sellantes, productos farmacéuticos, agrícolas, construcción y/o cosmética.	<i>Esta reivindicación fue eliminada mediante memorial presentado el 05 de abril de 2017 en respuesta al No. 14155 notificado el 09 de diciembre de 2016.</i>
16. El artículo de la reivindicación 15, CARACTERIZADO porque el plástico es seleccionado del grupo que consiste en películas, películas sopladas o películas respirables, fibras, cloruro de polivinilo, plastisoles, polímeros termo-endurecibles, poliésteres insaturados termo-endurecibles o poliuretanos insaturados termo-endurecibles, alimentos, artículos cosméticos, sellantes, farmacéuticos, papel, estucados de papel, artículos de recubrimiento, pintura, adhesivos y mezclas de los mismos.		<i>Esta reivindicación está basada en la reivindicación 15 original y en la reivindicación 14 otorgada en Europa.</i>