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Eve: 378 FASENACIONALI
Folios: 47



Industria y Comercio

SUPERINTENDENCIA

DELEGATURA PROPIEDAD INDUSTRIAL

SOLICITUD DE PATENTE DE INVENCION
PCT

EXPEDIENTE No _____

TITULO PRODUCTOS DE YESO LIVIANOS QUE
TIENEN UNA RESISTENCIA MEJORADA AL AGUA

CLASIFICACION INTERNACIONAL _____

SOLICITANTE BPB LIMITED

DOMICILIO Coventry, Gran Bretaña

APODERADO DARIO CARDENAS NAVAS

BOGOTA D.C. _____

DIRECCIÓN DE NUEVAS CREACIONES
SOLICITUD FASE NACIONAL -PCT

1	(12) TIPO DE SOLICITUD	X X	Patente de invención Capitulo I	Patente de Modelo de Utilidad Capitulo II	
2	DATOS SOLICITUD INTERNACIONAL PCT (86)				
Solicitud Internacional No.		PCT/GB2010/052011		Fecha	02.12.2010
Publicación Internacional No.		WO 2011/067601 A1		Fecha	09.06.2011
3	(54) TÍTULO DE LA INVENCIÓN (200 caracteres o espacios máximos)				
PRODUCTOS DE YESO LIVIANOS QUE TIENEN UNA RESISTENCIA MEJORADA AL AGUA					
CLASIFICACIÓN INTERNACIONAL (51) CIP					
5	(71) SOLICITANTE (S) ☐ Esta persona también es inventor. Para datos adicionales utilizar hoja de información complementaria				
APELLIDOS O RAZÓN SOCIAL		NOMBRE		IDENTIFICACIÓN	TIPO
BPB LIMITED					
6	DATOS DEL SOLICITANTE				
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DEPARTAMENTO/ESTADO				NACIONALIDAD O LUGAR DE CONSTITUCIÓN	
PAÍS DE RESIDENCIA		Gran Bretaña		Gran Bretaña	
7	(72) INVENTOR (ES) Para datos adicionales utilizar hoja de información complementaria				
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FISHER		Robin Daniel		Británico	
DIRECCIÓN DE CORREO ELECTRÓNICO:					
8	DATOS INVENTOR (ES)				
PAÍS RESIDENCIA		DEPARTAMENTO/ESTADO		CIUDAD	DIRECCIÓN
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OTRO(S) SOLICITANTE(S) Y/O (OTRO(S)) INVENTOR(ES)					
Los demás solicitantes y/o (demás) inventores se indican en una hoja a continuación.					
9	(74)	REPRESENTANTE		X	APODERADO
APELLIDOS		NOMBRES		IDENTIFICACIÓN	
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PAÍS		COLOMBIA		No. DE PROTOCOLO EN LA OFICINA	

10	(30)	DECLARACIONES DE PRIORIDAD		X	SI		NO
(33) PAÍS DE ORIGEN		CÓDIGO PAÍS		(31) NÚMERO		(32) FECHA (AAAA/MM/DD)	
GRAN BRETAÑA		GB		0921293.7		04.12.2009	
http://patentscope.wipo.int/search/en/detail.jsf?docId=WO2011067601&recNum=38&tab=PCTDocuments&maxRec=7779928&office=&prevFilter=&sortOption=Pub+Date+Desc&queryString=							
11	DECLARACIÓN SOBRE USO DE RECURSOS GENÉTICOS O BIOLÓGICOS						
<i>Declaro que el objeto de la presente solicitud de patente fue obtenido a partir de recursos genéticos o biológicos de los que cualquiera de los países miembros de la Comunidad Andina es país de origen.</i>							
☐ SI ☒ NO							
Nota: En caso afirmativo deberá anexar copia del contrato de acceso de recursos genéticos o productos derivados, o certificado o número de registro, expedido por la Autoridad competente.							
12	DECLARACIÓN SOBRE USO DE CONOCIMIENTOS TRADICIONALES						
<i>Declaro que el objeto de la presente solicitud de patente fue obtenido a partir de conocimientos tradicionales de comunidades indígenas, afroamericanas o locales de países miembros de la Comunidad Andina.</i>							
☐ SI ☒ NO							
Nota: En caso afirmativo deberá anexar la licencia o autorización de uso de conocimiento tradicional, o certificado, o número de registro expedido por la Autoridad competente.							
13	REDUCCIÓN DE TASAS						
<i>Declaro que carezco de medios económicos para presentar la solicitud de patente.</i>							
☐ SI ☒ NO							
Nota: En caso de ser persona natural y carecer de medios económicos, y por lo tanto, aplique la reducción de tasas a que se refiere la resolución vigente en tarifas, debe firmar la presente solicitud bajo la gravedad de juramento.							
Micro, pequeñas y medianas empresas		Universidades públicas o privadas		Entidades sin ánimo de lucro			
☐ Copia simple de la declaración de renta del año inmediatamente anterior, o en su defecto prueba documental idónea.		☐ Copia acto de reconocimiento institucional emitido por el Ministerio de Educación. Acreditación Colciencias.		☐ Copia de registro vigente en Cámara de comercio.			
☐ Documento de constancia de cumplimiento con lo establecido en la ley 905 de 2004.				☐ Hoja de información complementaria.			
				☐ Otros, especificar			
14	AUTORIZACIÓN DE NOTIFICACIÓN EN LÍNEA			SI	X	NO	
Manifiesto que he leído y entendido perfectamente los términos y condiciones de uso de medios electrónicos para las notificaciones en línea a través de Internet de los actos administrativos proferidos por la Superintendencia de Industria y Comercio que deben ser notificados personalmente y, en consecuencia, autorizo el servicio de notificación a través de internet.							
14	COMPROBANTE DE PAGO O PAGO ELECTRÓNICO		N° 12-0063918		Fecha 25.06.2012		
15	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)							
DARIO CARDENAS NAVAS Jnt							
16	ORDEN Y RELACIÓN DE DOCUMENTOS QUE ACOMPAÑAN LA SOLICITUD						
Documentación Técnica Solicitud Internacional en castellano				Documentación Jurídica			
1.	☒	Descripción	N° de folios: 8	9.	☐	Poderes, si fuera el caso.	
2.	☒	Reivindicaciones.....	N° Reivindicaciones 10	10.	☐	Documento que legalmente pruebe la cesión del inventor al solicitante o a su causante	
3.	☐	Dibujos y/o figuras	N° folios:0	11.	☐	Copia del contrato de acceso de recursos genéticos o productos derivados, certificado o número de registro, si fuera el caso.	
4.	☒	Resumen.		12.	☐	Copia de la licencia o autorización de Conocimientos Tradicionales, certificado o número de registro, si fuera el caso.	
5.	☐	Certificado de depósito de material biológico si fuera el caso		13.	☐	Documento que acredita la existencia y representación legal, cuando el solicitante es persona jurídica.	
6.	☐	Listado de secuencias de nucleótidos y/o aminoácidos en forma digital si fuera el caso		14.	☒	Comprobante de pago de la tasa de presentación de la solicitud.	
7.	☐	Arte final 12 x 12.		15.	☐	Comprobante de pago por reivindicación de prioridad.	
8.	☐	Anexo formato digital.		16.	☐	Comprobante de pago de la tasa por concepto de excedente de palabras en la publicación.	
				17.	☐	Comprobante de pago por reivindicación adicional a 10.	

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
NIT : 800.176.089-2
- / -

Industria y Comercio
SUPERINTENDENCIA

RECIBO DE CAJA

No. 12 - 0063918

Bogotá D.C., Junio 25 de 2012 - 12:29:15

RECIBIDO DE : CARDENAS & CARDENAS ABOGADOS PI LTDA NI 830.083.491

*** Soporte del Pago ***

TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	VR. PAGO
CONSIGNACION	BANCO DE BOGOTA	062754387	196860112	25/06/2012	9.610.000.00

*** Conceptos Pagados ***

CANT.	RENTISTICO	CONCEPTO	Vr. UNDITARIO	Vr. CONCEPTO
1	50005-01-01 SOLICITUDES	1 TRAMITES DE SOL. DE PATENTE DE INVENCIÓN	590.000.00	590.000.00
				\$590.000.00

SON: **QUINIENTOS NOVENTA MIL PESOS MONEDA CORRIENTE***

Responsable: _____

Recibo de Caja Aplicado al Expediente No. _____

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



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Junio 25 de 2012 - 12:29:17



Industria y Comercio

SUPERINTENDENCIA			
(21) N° de solicitud:		(22) Fecha de solicitud:	
(51) Clasificación Internacional :			
(71)Solicitante(s)	BPB LIMITED		
(72) Inventor(es)	ROBIN DANIEL FISHER		
(74) Apoderado: DARIO CARDENAS NAVAS			
(30) Prioridad	(31) No. Prioridad	32) Fecha	(33) País
	0921293.7	04.12.2009	GRAN BRETAÑA
(85) Fecha inicio fase nacional: 04.07.2012			
(86) Datos relativos a la presentación de la solicitud PCT			
Fecha de presentación de la solicitud: 02.12.2010			
No. de solicitud PCT/GB2010/052011			
(54) Título			
PRODUCTOS DE YESO LIVIANOS QUE TIENEN UNA RESISTENCIA MEJORADA AL AGUA			

(21) N° de solicitud:				(22) Fecha de solicitud:	
(51) Clasificación Internacional :					
(71)Solicitante(s) BPB LIMITED					
(72) Inventor(es) ROBIN DANIEL FISHER					
(74) Apoderado: DARIO CARDENAS NAVAS					
(30) Prioridad		(31) No. Prioridad	32) Fecha	(33) País	
		0921293.7	04.12.2009	GB	
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Fecha de presentación de la solicitud: 02.12.2010			No. Publicación WO 2011/067601 A1		
No. de solicitud PCT/GB2010/052011					
(54) Título: PRODUCTOS DE YESO LIVIANOS QUE TIENEN UNA RESISTENCIA MEJORADA AL AGUA					
(57) Resumen:					
Se fabrica un producto a partir de una dispersión de sulfato de calcio acuoso fraguable que tiene una relación de agua / sólidos inferior a 0,4: 1, y tiene cuerpos huecos livianos distribuidos a través de la misma que poseen superficies impermeables al agua (como por ejemplo, bolitas de poliestireno expandido). La dispersión contiene un cemento hidratable (como por ejemplo, sulfo aluminato de calcio) que es capaz de hidratarse en la presencia de la dispersión de sulfato de calcio El cemento hidratable es de tal manera que reacciona con el exceso de agua de la dispersión aumentando de esta manera la resistencia al agua del producto resultante.					

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(21) N° de solicitud:		(51) Int Cl:	
22) Fecha de solicitud:		(71) Solicitante(s) BPB LIMITED	
(30) Prioridad	(31) No. Prioridad 0921293.7	32) Fecha 04.12.2009	(33) País GB
		(72) Inventor(es) ROBIN DANIEL FISHER (74) Apoderado: DARIO CARDENAS NAVAS	
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(86)	Datos relativos a la presentación de la solicitud PCT		Fecha 09.06.2011
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	No. de solicitud PCT/GB2010/052011		
(54) Título: PRODUCTOS DE YESO LIVIANOS QUE TIENEN UNA RESISTENCIA MEJORADA AL AGUA			

Resumen:

Se fabrica un producto a partir de una dispersión de sulfato de calcio acuoso fraguable que tiene una relación de agua / sólidos inferior a 0,4: 1, y tiene cuerpos huecos livianos distribuidos a través de la misma que poseen superficies impermeables al agua (como por ejemplo, bolitas de poliestireno expandido). La dispersión contiene un cemento hidratable (como por ejemplo, sulfo aluminato de calcio) que es capaz de hidratarse en la presencia de la dispersión de sulfato de calcio. El cemento hidratable es de tal manera que reacciona con el exceso de agua de la dispersión aumentando de esta manera la resistencia al agua del producto resultante.

Productos de yeso livianos que tienen una resistencia mejorada al agua

La presente invención está relacionada con productos de yeso que tienen superficies expuestas y proporciona dichos productos con una resistencia mejorada al agua.

Los productos de yeso, incluyendo bloques de yeso, placas de yeso sin papel, y también revestimientos de yeso, pueden absorber agua, en especial cuando los productos han sido diseñados para ser usados en un medio ambiente húmedo o mojado, dado que dichos productos tienen superficies expuestas en las cuales puede ingresar agua.

Un método estándar para probar la “resistencia al agua” de una placa para tabiques requiere que ésta tenga una absorción al agua no superior a un 5% - por ejemplo, expresada como el porcentaje en peso del agua absorbida por una muestra de placa de 300 mm x 300 mm sumergida en agua a 20° C durante dos horas. Se puede usar dicha placa resistente a la humedad en situaciones donde existe un riesgo de exposición limitada de la placa a la humedad.

Con el objeto de lograr resistencia a la humedad, se ha sugerido la incorporación de un aditivo hidrófobo en la lechada de yeso empleada para formar la placa.

Por ejemplo, el aditivo hidrófobo puede ser silicona, según se describe en nuestra patente 957070 de Europa; el uso de dicho aditivo hidrófobo requiere de curado térmico y sería ventajoso evitar el gasto de energía que implica dicho curado térmico. Asimismo, en WO2008/152519 se ha propuesto el uso de copolímeros de látex, pero no está claro que el yeso resultante tenga una larga resistencia al agua.

Sigue siendo conveniente aumentar las propiedades mecánicas de los productos de yeso fraguado bajo condiciones húmedas, y fabricar dichos productos con una porosidad abierta reducida, ya que esta propiedad aumentará la resistencia al agua.

En particular existe la necesidad de contar con productos de yeso resistentes al agua que tengan mejores propiedades de resistencia después de un contacto prolongado con el agua y que se puedan fabricar con un régimen de secado suave.

De acuerdo a la presente invención, se proporciona un método para fabricar un producto de yeso resistente al agua, en el cual se fabrica el producto de yeso a partir de una dispersión de sulfato de calcio acuoso fraguable que tiene una relación de agua / sólidos

inferior a 0,4: 1, dispersión que tiene cuerpos huecos livianos distribuidos a través de la misma que poseen superficies impermeables al agua; y un cemento hidratable (como por ejemplo, sulfo aluminato de calcio) que es capaz de hidratarse en presencia de la dispersión de sulfato de calcio, siendo el cemento hidratable reactivo con el exceso de agua de la dispersión. De este modo, el cemento hidratable reacciona con el agua, de preferencia, sin potencia térmica importante, llenando los poros que de otro modo podrían producirse por la presencia de exceso de agua durante el curado.

Habitualmente, el cemento hidratable es un cemento de sulfo aluminato de calcio, preparado de tal manera que reacciona con el agua en la dispersión formando etringita.

El cemento hidratable está presente en una cantidad suficiente como para reaccionar con el exceso de agua resultante de la reacción del sulfato de calcio con el agua, como por ejemplo, de un 5% a un 15% en peso, en base al peso del polvo hidráulico (es decir, el peso de los sólidos fraguables en la dispersión de sulfato de calcio, incluyendo el cemento hidratable). Una cantidad más preferible es de aproximadamente un 10%, por ejemplo, entre un 8% y un 12% en la misma base.

Habitualmente, el sulfato de calcio es un material que se sabe es adecuado para un yeso de baja demanda de agua; entre los ejemplos se incluyen yeso alfa, anhidrita II o anhidrita III. La dispersión puede contener también otros materiales para reducir al máximo la demanda de agua de la misma, como por ejemplo uno o más superplastificantes. El sulfato de calcio puede ser alternativamente un yeso beta con un superplastificante de alto rendimiento.

Los cuerpos huecos livianos pueden ser, por ejemplo, bolitas de poliestireno expandido, corcho granulado, esferas huecas, o esferas hechas mediante el post-fraguado polimerizado de espuma de polímero de modo que las esferas sean impermeables al agua. Cada cuerpo hueco tiene uno o más vacíos o cavidades cerradas, siendo los vacíos o cavidades en cada cuerpo de una naturaleza de poros cerrados (es decir, que no permite la comunicación de un gas y/o líquido con la superficie del cuerpo respectivo). En cada uno de dichos cuerpos, los vacíos o cavidades están rodeados por la superficie impermeable al

agua del cuerpo hueco. Habitualmente, los cuerpos huecos están presentes en una cantidad de un 0,5% a un 2% en peso, en base al peso del polvo hidráulico.

En algunas modalidades de la invención, resulta de particularmente preferencia que la dispersión contenga por lo menos un aditivo que tenga un carácter hidrófobo sustancial; habitualmente, dicho aditivo es por lo menos un compuesto anfifílico como por ejemplo, un jabón. Ejemplos preferidos de dichos jabones son sales de ácidos grasos de cadena larga tales como estearatos de calcio, cinc, magnesio y/o aluminio. Dichos jabones contienen una cadena de hidrocarbano (que contribuye al carácter hidrófobo) y también un grupo de sal carboxílica (que contribuye al carácter hidrófilo) - de ahí la razón por la cual se les puede caracterizar como anfifílicos. Una cantidad preferida del mismo es de un 1% a un 15%, en base al peso del polvo hidráulico.

Asimismo, la dispersión puede contener un agente repelente al agua que se cura para formar una resina de silicona hidrófoba en un medio ambiente alcalino. Dichos ejemplos son alcoxisilanos de alquilo / vinilo, alquil / vinil siloxanos, alquil / vinil silanoles, siliconatos de alquilo y mezclas de los mismos. Ejemplos adecuados disponibles en el comercio son Wacker Silres BS16 y BS1260. En algunas modalidades, el agente repelente al agua, o un precursor del mismo, puede estar en forma de polvo.

La dispersión puede contener también un refuerzo fibroso como por ejemplo, en particular, refuerzo de fibra de vidrio; cuando el refuerzo de fibra de vidrio está presente se prefiere especialmente que la dispersión contenga también un agente repelente al agua como por ejemplo, el que se describe en el párrafo precedente.

Los sólidos usados para conformar la dispersión pueden ser suministrados en la forma de ingredientes secos, para ser preparados in situ con agua para formar la dispersión. Se puede proporcionar dicha mezcla seca para moldear bloques livianos in situ.

Al momento de usarse, se deja que la dispersión fragüe formando un cuerpo de yeso como por ejemplo, un bloque o una placa, o una capa de revestimiento aplicada a una superficie de pared o similar.

Cuando se produce una placa de yeso de acuerdo a la invención, la placa puede estar con o sin refuerzo en la superficie o láminas de revestimiento; cuando se usa refuerzo para

la superficie, éste último puede ser por ejemplo, de entelado de fibra (“fibre scrim”), malla de fibra o papel.

Se prefiere de manera especial que los cuerpos sean producidos sin calentamiento aplicado en forma externa para secarlos, lo que podría ser otra ventaja debido a los altos costos energéticos de la producción normal de yeso (tanto en la compra directa de la energía como en la compensación de las emisiones de CO₂); por lo tanto, los productos de acuerdo a la invención pueden tener un reducido consumo de energía.

Otros materiales, adyuvantes e ingredientes no perjudiciales pueden, cuando proceda, estar presentes en la dispersión. Estos materiales no perjudiciales pueden incluir otros ingredientes opcionales como por ejemplo, almidón, aceleradores del fraguado, y retardadores, inhibidores de la deformación (como por ejemplo, agentes anti-corrimento), agentes anti-retracción, inhibidores de la recalcinación, estabilizadores de espuma, bactericidas, fungicidas, ajustadores del pH, agentes colorantes, retardadores de incendios y rellenos (como por ejemplo, materiales minerales particulados o plásticos, que pueden estar en algunas modalidades en forma expandida).

El pH de la dispersión usada de acuerdo a la invención está habitualmente en el rango de 10 a 13.

La presente invención se extiende a los productos de construcción de yeso tales como bloques, placas para tabiques, revestimientos o similares cuando se producen mediante un método de acuerdo a la invención, en especial aquellos productos para usar en un ambiente exterior y aquellos productos que están expuestos a la lluvia u otro contacto con agua, como por ejemplo, con una masa de agua.

A continuación, en los Ejemplos ilustrativos, se presentan ciertas características ventajosas de la invención y la forma en que pueden ponerse en práctica.

Ejemplo 1

Se produjeron muestras de laboratorio usando una Mezcladora Kenwood KM300 Chef, con acción mezcladora planetaria. El material hidráulico era yeso α puro (Fórmula Saint-Gobain, “Crystacal Base”) o una mezcla de 9:1 de yeso α : cemento CSA Belitex. Se redujo la densidad con Bolitas de Poliestireno Expandido de 1 mm de diámetro en 1,2% de

peso/peso de material hidráulico mezclado en seco en una bolsa plástica. Se mezcló también el polvo de estearato de calcio, es decir grado “SM-Microfine” disponible en FACI (Reino Unido), en esta etapa en subconjuntos 1.3 y 1.4. Se calentó agua de la llave a 40° C para reproducir la temperatura típica de una lechada de planta cuando se mezcla con el polvo. Se pesó el agua a 0,35:1 de agua / polvo sólido y se agregó al recipiente de mezcla primero, seguido del aditivo hidrófobo líquido BS1260 en los subconjuntos 1.5 y 1.6.

Se vertió el material hidráulico con bolitas de EPS según ECOG sobre el líquido durante 30 segundos, se dejó que reposara por 30 segundos y se mezcló durante un minuto empezando en el “setting” (fraguado) 1 y aumentando paulatinamente la velocidad cada 10 segundos de mezcla hasta finalizar en el “setting” (fraguado) 6. Se depositó la lechada en un molde de caucho de silicona para configurar 6 cuboides que medían 20 mm x 20 mm x 100mm. Una vez completada la hidratación del yeso (esto demoró habitualmente 1 hora y fue determinado por la medición de la temperatura), se desmoldaron las muestras y luego se sellaron por 48 horas en una bolsa plástica para permitir que el CSA se hidratara más. Luego se secaron las muestras a 40° C por 12 horas o más. La preparación incluyó cortar 5 mm de los bordes usando una sierra de cinta para exponer el núcleo, luego acondicionar en una cámara a 23° C/ 50% de HR por 12 horas o más. Se tomaron el peso y las dimensiones en este punto para proporcionar el peso inicial y la densidad.

Los resultados obtenidos se muestran en la Tabla 1 a continuación.

TABLA 1

Ref.	Polvo hidráulico	Aditivo repelente al agua	Densidad seca promedio (kg/m ³)	Absorción de agua (%)		
				2 horas	24 horas	72 horas
1.1	yeso α	Ninguno	733	16,5	16,3	16,1
1.2	yeso α + CSA (9:1)	Ninguno	783	1,24	12,2	12,2
1.3		Estearato de calcio 1%	800	9,1	10,3	10,0
1.4		Estearato de calcio 5%	757	5,1	8,7	8,7
1.5		BS1260 Wacker 0,1%	717	5,8	8,2	10,0
1.6		BS1260 Wacker 0,5%	749	1,5	2,6	3,1

Ejemplo 2 (Comparativo)

Para fines de comparación, en Saint-Gobain Gyproc. se obtuvo un trozo de Glasroc disponible en el comercio. Se agregó polimetil hidrógeno siloxano al producto reforzado de vidrio en la etapa de mezcla y se cubrió con un polímero para protegerlo contra el ingreso de agua en la superficie. Se cortó en trozos de 125 mm x 125 mm para someterlo a pruebas de absorción del agua. Los resultados se muestran en comparación con los del Ejemplo 3 en la Tabla 2.

Ejemplo 3

El método usado fue el mismo que el que se detalla en el Ejemplo 2, aparte de las siguientes diferencias.

El polvo hidráulico fue una mezcla de 9:1 de yeso α / cemento CSA. El agua de mezclado a 40° C fue levemente más alta que en el Ejemplo 1, en una relación de agua / sólidos de 0,4. Se depositó un exceso de lechada en dos moldes con un material de revestimiento de tejido de vidrio de Johns Manville debajo. El molde estaba hecho con una sección cuadrada de latón que medía 152 mm x 152 mm x 12,5 mm (dimensiones internas). Luego se colocó un pedazo superior de tejido de vidrio sobre la lechada, que fue forzada a penetrar deslizando una barra de metal a través del mismo, impregnando de este modo el tejido. El molde fue cargado entre dos láminas de Perspex.

Después de la hidratación, se desmoldaron las muestras y se secaron a 60° C, 20% de HR en una cámara climática Vötsch por 12 horas. La preparación incluyó cortar los bordes usando una cierra de cinta para exponer el núcleo y producir muestras de 114 - 122 mm de largo y ancho.

Los resultados de las pruebas de absorción del agua se muestran en la Tabla 2. Los resultados de las pruebas de resistencia a la humedad se muestran en la Tabla 3.

TABLA 2

Ref.	Polvo hidráulico	Aditivo repelente al agua	Densidad seca promedio (kg/ m³)	Absorción de agua (%)			
				2 horas	24 horas	72 horas	240 horas
2	yeso β	Polimetil hidrógeno siloxano	709	2,7	40,3	51,8	64,4
3.1	yeso α + CSA (9:1)	Ninguno	846	15,2	15,9	16,2	17,1
3.2		BS1260 Wacker 0,25%	823	6,1	9,8	11,9	15,9
3.3		BS1260 Wacker 0,5%	793	4,7	5,8	6,8	9,7

TABLA 3

Ref.	Polvo hidráulico	Aditivo repelente al agua	Resistencia a la humedad (Promedio; N)	Error en resistencia a la humedad (Desviación estándar 1; N)
2	yeso β	Polimetil hidrógeno siloxano	18,7	1,3
3.1	yeso α + CSA (9:1)	Ninguno	120,6	11,6
3.2		BS1260 Wacker 0,25%	95,7	6,4
3.3		BS1260 Wacker 0,5%	99,4	10,0

Prueba de absorción del agua

Se realizó la prueba de absorción del agua sumergiendo las muestras en agua de la llave a 23° C de modo que se mantuvo una columna de agua de 30 mm entre la parte superior de la muestra y la línea del agua. Después de determinados periodos de tiempo, se sacaron las muestras y el exceso de agua se secó antes de volver a pesar. El método usado fue el mismo que el que se indicó en EN520: 2004 sección 5.9.2., pero el tamaño de la muestra fue más pequeño y se usaron tiempos de inmersión superiores a 2 horas para demostrar la resistencia mejorada al agua de la invención. Los resultados del Ejemplo 1 son promedios de las mediciones por triplicado en tanto que los Ejemplos 2 y 3 son de mediciones duplicadas.

Prueba de resistencia a la humedad

Se determinó la resistencia a la humedad de las muestras sumergidas durante 240 horas (es decir, muestras saturadas) usando un método similar a la ASTM 473 sección 12 para mediciones de la dureza del núcleo y bordes de paneles de yeso. La fuerza máxima requerida para penetrar con un punzón de acero de 2 mm de diámetro (la norma ASTM-C 473 especifica 2,5 mm) 13 mm de la muestra fue medida con un dinamómetro Mecmesin a una velocidad de travesaño de 30 mm/min. Se repitió la prueba alrededor del borde de la muestra 16 veces a fin de determinar el promedio.

Reivindicaciones

1. Un método para producir un producto de yeso resistente al agua, en el cual se fabrica un producto a partir de una dispersión de sulfato de calcio acuoso fraguable que tiene una relación de agua / sólidos inferior a 0,4: 1, dispersión que tiene cuerpos huecos livianos distribuidos en la misma que a su vez poseen superficies impermeables al agua; y un cemento hidratable que es capaz de hidratarse en la presencia de la dispersión de sulfato de calcio, siendo el cemento hidratable reactivo con el exceso de agua de la dispersión, donde el cemento hidratable está presente en una cantidad de un 5% a un 15%, en base al peso del polvo hidráulico.
2. Un método de acuerdo a la reivindicación 1, donde el cemento hidratable comprende sulfo aluminato de calcio.
3. Un método de acuerdo a la reivindicación 1 o 2, donde los cuerpos huecos son de poliestireno expandido.
4. Un método de acuerdo a cualquiera de las reivindicaciones 1 a 3, donde los cuerpos huecos están presentes en una cantidad de un 0,5% a un 2% en peso, en base al peso del polvo hidráulico.
5. Un método de acuerdo a cualquiera de las reivindicaciones 1 a 4, donde la dispersión contiene un compuesto anfifílico.
6. Un método de acuerdo a la reivindicación 5, donde el cuerpo anfifílico es un jabón.
7. Un método de acuerdo a cualquiera de las reivindicaciones 1 a 6, donde la dispersión contiene un agente repelente al agua que se cura para formar una resina de silicona hidrófoba en un medio ambiente alcalino.
8. Un método de acuerdo a la invención, donde la dispersión contiene también refuerzo de fibra de vidrio.
9. Un método de acuerdo a cualquiera de las reivindicaciones 1 a 8, donde el producto de yeso tiene refuerzo en la superficie.
10. Un método de acuerdo a cualquiera de las reivindicaciones 1 a 9, donde el producto de yeso es fabricado sin calentamiento aplicado externamente.

RESUMEN

Productos de yeso livianos que tienen una resistencia mejorada al agua

Se fabrica un producto a partir de una dispersión de sulfato de calcio acuoso fraguable que tiene una relación de agua / sólidos inferior a 0,4: 1, y tiene cuerpos huecos livianos distribuidos a través de la misma que poseen superficies impermeables al agua (como por ejemplo, bolitas de poliestireno expandido). La dispersión contiene un cemento hidratable (como por ejemplo, sulfo aluminato de calcio) que es capaz de hidratarse en la presencia de la dispersión de sulfato de calcio. El cemento hidratable es de tal manera que reacciona con el exceso de agua de la dispersión aumentando de esta manera la resistencia al agua del producto resultante.

Lightweight gypsum products having enhanced water resistance

The present invention relates to gypsum products having exposed surfaces and provides such products with enhanced water resistance.

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Gypsum products including gypsum blocks, paperless gypsum board, and also gypsum facings, can suffer from water absorption, especially where the products are intended for use in a wet or damp environment, because such products have exposed surfaces which are susceptible to water ingress.

10

A standard method of testing "moisture resistant" wallboard requires it to have a water absorption not greater than 5% - for example, expressed as the weight percentage of water absorbed by a 300mm x 300mm board sample immersed in water at 20°C for two hours. Such moisture resistant board can be used in situations where there is a risk of

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limited exposure of the board to moisture.

In order to achieve moisture resistance, it has been suggested that a hydrophobic additive may be incorporated into the plaster slurry employed to form the board.

20

For example, the hydrophobic additive may be a silicone, as described in our European patent 957070; the use of such a hydrophobic additive requires thermal curing, and it would be advantageous to avoid the requirement for energy input that such thermal curing implies. Latex copolymers have also been proposed in WO2008/152519, but it is not clear that the resulting plaster has long term water resistance.

25

It remains desirable to increase the mechanical properties of set gypsum products under wet conditions, and produce such products with lowered open porosity as this property will enhance water-resistance.

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In particular, there is a need for water-resistant gypsum products having improved strength properties after prolonged contact with water and which can be produced with a mild drying regime.

According to the present invention there is provided a method of producing a water-resistant gypsum product, in which the gypsum product is produced from a settable aqueous calcium sulphate dispersion having a water to solids ratio of less than 0.4 to 1, the dispersion having distributed therethrough lightweight hollow bodies having water-impervious surfaces; and a hydratable cement (such as calcium sulpho aluminate) which is capable of hydration in the presence of the calcium sulphate dispersion, the

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hydratable cement being reactive with excess water in the dispersion. The hydratable

cement thereby reacts with water, preferably without significant thermal input, so as to fill pores which might otherwise result from the presence of excess water during curing.

5 The hydratable cement is typically a calcium sulpho aluminate cement, which is such that it reacts with water in the dispersion to form ettringite.

10 The hydratable cement is present in an amount sufficient to react with excess water resulting from reaction of the calcium sulphate with the water, such as from 5 to 15% by weight, based on the weight of the hydraulic powder (that is, on the weight of settable solids in the calcium sulphate dispersion, including the hydratable cement). A more preferred amount is about 10%, such as 8 to 12 % on the same basis.

15 The calcium sulphate in the dispersion is typically one known to be suitable for a low water demand plaster; examples include alpha plaster, anhydrite II or anhydrite III. The dispersion may further contain other materials to minimise the water demand thereof, such as one or more superplasticisers. The calcium sulphate may alternatively be beta plaster with a high performance superplasticiser.

20 The lightweight hollow bodies may be, for example, beads of expanded polystyrene, granulated cork, hollow spheres, or spheres made by a polymer foam polymerised post-setting such that the spheres are impervious to water. The hollow bodies each have one or more voids or closed cavities, the voids or cavities in each body being of a closed pore nature (that is not permitting gas and/or liquid communication to the surface of the respective body). In each such body, the voids or cavities are surrounded by the water-
25 impervious surface of the hollow body. The hollow bodies are typically present in an amount of 0.5 to 2% by weight, based on the weight of the hydraulic powder.

30 In some embodiments of the invention, it is particularly preferred that the dispersion contains at least one additive having substantial hydrophobic character; such an additive is typically at least one amphiphilic compound, such as a soap. Preferred examples of such soaps are salts of long chain fatty acids, such as stearates of calcium, zinc, magnesium and/or aluminium. Such soaps contain a hydrocarbon chain (which contributes to the hydrophobic character) and also a carboxylic salt group (which contributes to the hydrophilic character) – hence why they can be characterised as
35 amphiphiles. A preferred amount thereof is from 1 to 15%, based on the weight of the hydraulic powder.

40 The dispersion may further contain a water repellent agent that cures to form a hydrophobic silicone resin in an alkaline environment. Such examples are alkyl/ vinyl alkoxysilanes, alkyl/ vinyl siloxanes, alkyl/ vinyl silanols, alkyl siliconates and mixtures

thereof. Suitable examples commercially available are Wacker Silres BS16 and BS1260. In some embodiments, the water repellent agent, or a precursor thereof, may be in powder form.

- 5 The dispersion may further contain fibrous reinforcement, such as, in particular, glass fibre reinforcement; it is especially preferred when glass fibre reinforcement is present that the dispersion also contains a water repellent agent such as that described in the preceding paragraph.
- 10 The solids used to make up the dispersion may be provided in the form of dry ingredients, to be made up in situ with water so as to form the dispersion. Such a dry mix can be provided for casting lightweight blocks in situ.

- 15 In use, the dispersion is allowed to set to form a plaster body, such as a block or a board, or a facing layer applied to a wall surface or the like.

When gypsum board is produced according to the invention, the board may be with or without surface reinforcement or liner sheets; when surface reinforcement is used, the latter may, for example, be of fibre scrim, fibre mesh or paper.

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It is particularly preferred that the bodies are produced without externally applied heating to cause drying thereof, which may be a further advantage due to the high energy costs in normal gypsum board production (both in the direct purchase of the energy and in the offsetting of CO₂ emissions off-setting); products according to the invention therefore can

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have lowered embodied energy..

Other non-deleterious materials, adjuvants and ingredients may, when appropriate, be present in the dispersion. Such non-deleterious materials may include optional further ingredients, such as starch, set accelerators and retarders, deformation inhibitors (such

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as anti-sagging agents), anti-shrink additives, recalcination inhibitors, foam stabilisers, bactericides, fungicides, pH adjusters, colouring agents, fire retardants and fillers (such as particulate mineral material or plastics, which may in some embodiments be in expanded form).

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The pH of the dispersion used according to the invention is typically in the range 10 to 13.

The present invention extends to gypsum building products such as blocks, wallboard, facings or the like when produced by a method according to the invention, especially

such products for use in an outdoor environment and such products which are subject to rain or other contact with water, such as with a body of water.

Certain advantageous features of the invention and the way it can be put into operation are now illustrated in the following worked illustrative Examples.

Example 1

Laboratory samples were produced using a Kenwood KM300 Chef Mixer, with planetary mixing action. The hydraulic material was pure α plaster (Saint-Gobain Formula, 'Crystacal Base') or a 9:1 blend of α plaster: Belitex CSA cement. The density was reduced with 1 mm diameter Expanded Polystyrene Beads at 1.2% w:w of hydraulic material dry blended in a plastic bag. The calcium stearate powder, namely "SM-Microfine" grade available from FACI (UK), was also blended at this stage in subsets 1.3 and 1.4. Tap water was pre-heated to 40°C to replicate a typical plant slurry temperature when mixed with the powder. The water was weighed at 0.35: 1, water: solid powder and added to the mixing bowl first, followed by the liquid hydrophobic additive BS1260 in the subsets 1.5 and 1.6.

The hydraulic material with EPS beads was poured on the liquid over 30 seconds, left to stand for 30 seconds and mixed over one minute starting at setting 1 and ramping up the speed incrementally each 10 seconds of mixing until finishing on setting 6. The slurry was deposited into a silicone rubber mould to cast 6 x cuboids measuring 20 mm x 20 mm x 100 mm. After hydration of the plaster was complete (this was typically 1 hour and was determined by temperature measurement) the samples were de-moulded and then sealed for 48 hours in a plastic bag to allow the CSA to hydrate further. The samples were then dried at 40°C for 12 hours or more. Preparation included cutting 5 mm off the edges using a bandsaw to expose the core, then conditioning in a chamber at 23°C/ 50% RH for 12 hours or more. The weight and dimensions were taken at this point to give the initial weight and density.

The results obtained are shown in the following Table 1.

TABLE 1

Ref	Hydraulic powder	Water repellent additive	Average dry density (kg/ m ³)	Water uptake (%)		
				2 hrs	24 hrs	72 hrs
1.1	α plaster	None	733	16.5	16.3	16.1
1.2	α plaster + CSA (9:1)	None	783	12.4	12.2	12.2
1.3		1% calcium stearate	800	9.1	10.3	10.0
1.4		5% calcium stearate	757	5.1	8.7	8.7
1.5		0.1% Wacker BS1260	717	5.8	8.2	10.0
1.6		0.5% Wacker BS1260	749	1.5	2.6	3.1

Example 2 (Comparative)

For comparative purposes, a commercially available piece of Glasroc was obtained from Saint-Gobain Gyproc. Polymethylhydrogensiloxane was added to the glass reinforced product at the mixer stage and coated with a polymer for further protection against surface water ingress. It was cut into 125 mm x 125 mm pieces for water absorption testing. Results are shown in comparison to those from Example 3 in Table 2.

Example 3

The method used was the same as detailed in Example 2, apart from the following differences.

The hydraulic powder was a 9:1 blend of α plaster: CSA cement. Gauging water at 40°C was slightly higher than in Example 1, at water: solids ratio of 0.4. An excess of slurry was deposited into two moulds with a glass tissue facing material from Johns Manville beneath. The mould made with brass square section measuring 152 mm x 152 mm x 12.5 mm (internal dimensions). A top piece of glass tissue was then placed on top of the slurry, which was forced through by sliding a metal bar across, thus impregnating the tissue. The mould was weighted down between two Perspex sheets.

After hydration, the samples were de-moulded and dried at 60°C, 20% RH in a Vötsch climatic chamber for 12 hours. Preparation included cutting off the edges using a bandsaw to expose the core and produce samples 114 – 122 mm in length and width.

The results of water absorption tests are shown in Table 2. The results of wet strength tests are shown in Table 3.

TABLE 2

Ref	Hydraulic powder	Water repellent additive	Average dry density (kg/ m ³)	Water uptake (%)			
				2 hrs	24 hrs	72 hrs	240 hrs
2	β plaster	Polmethyl hydrogensiloxane	709	2.7	40.3	51.8	64.4
3.1	α plaster + CSA (9:1)	None	846	15.2	15.9	16.2	17.1
3.2		0.25% Wacker BS1260	823	6.1	9.8	11.9	15.9
3.3		0.5% Wacker BS1260	793	4.7	5.8	6.8	9.7

TABLE 3

Ref	Hydraulic powder	Water repellent additive	Wet strength (Average; N)	Wet strength error (1 standard deviation; N)
2	β plaster	Polmethyl hydrogensiloxane	18.7	1.3
3.1	α plaster + CSA (9:1)	None	120.6	11.6
3.2		0.25% Wacker BS1260	95.7	6.4
3.3		0.5% Wacker BS1260	99.4	10.0

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Water absorption test

10 The water absorption test was done on by immersing the samples in tap water at 23°C such that a head of water of 30 mm between the top of the sample and water line was maintained. After given time periods the samples were removed and the excess water blotted before re-weighing. The method used was the same as that given in EN520: 2004 section 5.9.2, but the sample size was smaller and longer immersion times than 2 hours were used to demonstrate the improved water resistance of the invention. Example 1 results are averages from triplicate measurements, whereas Examples 2 and 15 3 are from duplicate measurements.

Wet strength test

20 The wet strength of the samples immersed for 240 hours (that is, saturated samples) was determined using a method similar to ASTM-C 473 section 12 for core and edge hardness measurements of gypsum panels. The maximum force required to drive a 2mm diameter steel punch (ASTM-C 473 specifies 2.5mm) through 13 mm of the sample was measured with a Mecmesin force gauge at a crosshead speed of 30 mm/ min. The test was repeated around the sample edge 16 times to determine the average.

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Claims

1. A method of producing a water-resistant gypsum product, in which the product is produced from a settable aqueous calcium sulphate dispersion having a water to solids ratio of less than 0.4 to 1, the dispersion having distributed therethrough lightweight hollow bodies having water-impervious surfaces; and a hydratable cement which is capable of hydration in the presence of the calcium sulphate dispersion, the hydratable cement being reactive with excess water in the dispersion, wherein the hydratable cement is present in an amount of 5 to 15%, based on the weight of hydraulic powder.
2. A method according to claim 1, wherein the hydratable cement comprises calcium sulpho aluminate.
3. A method according to claim 1 or 2, wherein the hollow bodies are of expanded polystyrene.
4. A method according to any of claims 1 to 3, wherein the hollow bodies are present in an amount of 0.5 to 2% by weight, based on the weight of hydraulic powder.
5. A method according to any of claims 1 to 4, wherein the dispersion contains an amphiphilic compound.
6. A method according to claim 5, wherein the amphiphilic compound is a soap.
7. A method according to any of claims 1 to 6, wherein the dispersion contains a water repellent agent that cures to form a hydrophobic silicone resin in an alkaline environment.
8. A method according to the invention, wherein the dispersion further contains glass fibre reinforcement.
9. A method according to any of claims 1 to 8, wherein the gypsum product has surface reinforcement.
10. A method according to any of claims 1 to 9, wherein the gypsum product is produced without externally applied heating.

ABSTRACT

Lightweight gypsum products having enhanced water resistance

- 5 The product is produced from a settable aqueous calcium sulphate dispersion which has a water to solids ratio of less than 0.4 to 1, and has distributed therethrough lightweight hollow bodies having water-impervious surfaces (such as expanded polystyrene beads). The dispersion contains a hydratable cement (such as calcium sulpho aluminate) which is capable of hydration in the presence of the
- 10 calcium sulphate dispersion. The hydratable cement is such that it reacts with excess water in the dispersion thereby enhancing the water resistance of the resulting product.

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(54) Title: **LIGHTWEIGHT GYPSUM PRODUCTS HAVING ENHANCED WATER RESISTANCE**

(57) Abstract: The product is produced from a settable aqueous calcium sulphate dispersion which has a water to solids ratio of less than 0.4 to 1, and has distributed therethrough lightweight hollow bodies having water-imperious surfaces (such as expanded polystyrene beads). The dispersion contains a hydratable cement (such as calcium sulpho aluminate) which is capable of hydration in the presence of the calcium sulphate dispersion. The hydratable cement is such that it reacts with excess water in the dispersion thereby enhancing the water resistance of the resulting product.

Lightweight gypsum products having enhanced water resistance

The present invention relates to gypsum products having exposed surfaces and provides such products with enhanced water resistance.

5

Gypsum products including gypsum blocks, paperless gypsum board, and also gypsum facings, can suffer from water absorption, especially where the products are intended for use in a wet or damp environment, because such products have exposed surfaces which are susceptible to water ingress.

10

A standard method of testing "moisture resistant" wallboard requires it to have a water absorption not greater than 5% - for example, expressed as the weight percentage of water absorbed by a 300mm x 300mm board sample immersed in water at 20°C for two hours. Such moisture resistant board can be used in situations

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where there is a risk of limited exposure of the board to moisture.

In order to achieve moisture resistance, it has been suggested that a hydrophobic additive may be incorporated into the plaster slurry employed to form the board.

20

For example, the hydrophobic additive may be a silicone, as described in our European patent 957070; the use of such a hydrophobic additive requires thermal curing, and it would be advantageous to avoid the requirement for energy input that such thermal curing implies. Latex copolymers have also been proposed in WO2008/152519, but it is not clear that the resulting plaster has long term water

25

resistance.

It remains desirable to increase the mechanical properties of set gypsum products under wet conditions, and produce such products with lowered open porosity as this property will enhance water-resistance.

30

In particular, there is a need for water-resistant gypsum products having improved strength properties after prolonged contact with water and which can be produced with a mild drying regime.

35

According to the present invention there is provided a method of producing a water-resistant gypsum product, in which the gypsum product is produced from a settable

aqueous calcium sulphate dispersion having a water to solids ratio of less than 0.4 to 1, the dispersion having distributed therethrough lightweight hollow bodies having water-impervious surfaces; and a hydratable cement (such as calcium sulpho aluminate) which is capable of hydration in the presence of the calcium sulphate dispersion, the hydratable cement being reactive with excess water in the dispersion. The hydratable cement thereby reacts with water, preferably without significant thermal input, so as to fill pores which might otherwise result from the presence of excess water during curing.

- 10 The hydratable cement is typically a calcium sulpho aluminate cement, which is such that it reacts with water in the dispersion to form ettringite.

The hydratable cement is present in an amount sufficient to react with excess water resulting from reaction of the calcium sulphate with the water, such as from 5 to 15% by weight, based on the weight of the hydraulic powder (that is, on the weight of settable solids in the calcium sulphate dispersion, including the hydratable cement). A more preferred amount is about 10%, such as 8 to 12 % on the same basis.

20 The calcium sulphate in the dispersion is typically one known to be suitable for a low water demand plaster; examples include alpha plaster, anhydrite II or anhydrite III. The dispersion may further contain other materials to minimise the water demand thereof, such as one or more superplasticisers. The calcium sulphate may alternatively be beta plaster with a high performance superplasticiser.

25 The lightweight hollow bodies may be, for example, beads of expanded polystyrene, granulated cork, hollow spheres, or spheres made by a polymer foam polymerised post-setting such that the spheres are impervious to water. The hollow bodies each have one or more voids or closed cavities, the voids or cavities in each body being of a closed pore nature (that is not permitting gas and/or liquid communication to the surface of the respective body). In each such body, the voids or cavities are surrounded by the water-impervious surface of the hollow body. The hollow bodies are typically present in an amount of 0.5 to 2% by weight, based on the weight of the hydraulic powder.

In some embodiments of the invention, it is particularly preferred that the dispersion contains at least one additive having substantial hydrophobic character; such an additive is typically at least one amphiphilic compound, such as a soap. Preferred examples of such soaps are salts of long chain fatty acids, such as stearates of calcium, zinc, magnesium and/or aluminium. Such soaps contain a hydrocarbon chain (which contributes to the hydrophobic character) and also a carboxylic salt group (which contributes to the hydrophilic character) – hence why they can be characterised as amphiphiles. A preferred amount thereof is from 1 to 15%, based on the weight of the hydraulic powder.

10

The dispersion may further contain a water repellent agent that cures to form a hydrophobic silicone resin in an alkaline environment. Such examples are alkyl/ vinyl alkoxysilanes, alkyl/ vinyl siloxanes, alkyl/ vinyl silanols, alkyl siliconates and mixtures thereof. Suitable examples commercially available are Wacker Silres BS16 and BS1260. In some embodiments, the water repellent agent, or a precursor thereof, may be in powder form.

The dispersion may further contain fibrous reinforcement, such as, in particular, glass fibre reinforcement; it is especially preferred when glass fibre reinforcement is present that the dispersion also contains a water repellent agent such as that described in the preceding paragraph.

The solids used to make up the dispersion may be provided in the form of dry ingredients, to be made up in situ with water so as to form the dispersion. Such a dry mix can be provided for casting lightweight blocks in situ.

In use, the dispersion is allowed to set to form a plaster body, such as a block or a board, or a facing layer applied to a wall surface or the like.

When gypsum board is produced according to the invention, the board may be with or without surface reinforcement or liner sheets; when surface reinforcement is used, the latter may, for example, be of fibre scrim, fibre mesh or paper.

It is particularly preferred that the bodies are produced without externally applied heating to cause drying thereof, which may be a further advantage due to the high

energy costs in normal gypsum board production (both in the direct purchase of the energy and in the offsetting of CO₂ emissions off-setting); products according to the invention therefore can have lowered embodied energy..

- 5 Other non-deleterious materials, adjuvants and ingredients may, when appropriate, be present in the dispersion. Such non-deleterious materials may include optional further ingredients, such as starch, set accelerators and retarders, deformation inhibitors (such as anti-sagging agents), anti-shrink additives, recalcination inhibitors, foam stabilisers, bactericides, fungicides, pH adjusters, colouring agents, fire
10 retardants and fillers (such as particulate mineral material or plastics, which may in some embodiments be in expanded form).

The pH of the dispersion used according to the invention is typically in the range 10 to 13.

- 15 The present invention extends to gypsum building products such as blocks, wallboard, facings or the like when produced by a method according to the invention, especially such products for use in an outdoor environment and such products which are subject to rain or other contact with water, such as with a body of water.

- 20 Certain advantageous features of the invention and the way it can be put into operation are now illustrated in the following worked illustrative Examples.

Example 1

- 25 Laboratory samples were produced using a Kenwood KM300 Chef Mixer, with planetary mixing action. The hydraulic material was pure α plaster (Saint-Gobain Formula, 'Crystacal Base') or a 9:1 blend of α plaster: Belitex CSA cement. The density was reduced with 1 mm diameter Expanded Polystyrene Beads at 1.2% w:w
30 of hydraulic material dry blended in a plastic bag. The calcium stearate powder, namely "SM-Microfine" grade available from FACI (UK), was also blended at this stage in subsets 1.3 and 1.4. Tap water was pre-heated to 40°C to replicate a typical plant slurry temperature when mixed with the powder. The water was weighed at 0.35: 1, water: solid powder and added to the mixing bowl first, followed by the liquid
35 hydrophobic additive BS1260 in the subsets 1.5 and 1.6.

The hydraulic material with EPS beads was poured on the liquid over 30 seconds, left to stand for 30 seconds and mixed over one minute starting at setting 1 and ramping up the speed incrementally each 10 seconds of mixing until finishing on setting 6. The slurry was deposited into a silicone rubber mould to cast 6 x cuboids measuring 20 mm x 20 mm x 100 mm. After hydration of the plaster was complete (this was typically 1 hour and was determined by temperature measurement) the samples were de-moulded and then sealed for 48 hours in a plastic bag to allow the CSA to hydrate further. The samples were then dried at 40°C for 12 hours or more. Preparation included cutting 5 mm off the edges using a bandsaw to expose the core, then conditioning in a chamber at 23°C/ 50% RH for 12 hours or more. The weight and dimensions were taken at this point to give the initial weight and density.

The results obtained are shown in the following Table 1.

TABLE 1

Ref	Hydraulic powder	Water repellent additive	Average dry density (kg/ m ³)	Water uptake (%)		
				2 hrs	24 hrs	72 hrs
1.1	α plaster	None	733	16.5	16.3	16.1
1.2	α plaster + CSA (9:1)	None	783	12.4	12.2	12.2
1.3		1% calcium stearate	800	9.1	10.3	10.0
1.4		5% calcium stearate	757	5.1	8.7	8.7
1.5		0.1% Wacker BS1260	717	5.8	8.2	10.0
1.6		0.5% Wacker BS1260	749	1.5	2.6	3.1

Example 2 (Comparative)

For comparative purposes, a commercially available piece of Glasroc was obtained from Saint-Gobain Gyproc. Polymethylhydrogensiloxane was added to the glass reinforced product at the mixer stage and coated with a polymer for further protection against surface water ingress. It was cut into 125 mm x 125 mm pieces for water absorption testing. Results are shown in comparison to those from Example 3 in Table 2.

Example 3

The method used was the same as detailed in Example 2, apart from the following differences.

- The hydraulic powder was a 9:1 blend of α plaster: CSA cement. Gauging water at 40°C was slightly higher than in Example 1, at water: solids ratio of 0.4. An excess of slurry was deposited into two moulds with a glass tissue facing material from Johns Manville beneath. The mould made with brass square section measuring 152 mm x 152 mm x 12.5 mm (internal dimensions). A top piece of glass tissue was then placed on top of the slurry, which was forced through by sliding a metal bar across, thus impregnating the tissue. The mould was weighted down between two Perspex sheets.
- 10 After hydration, the samples were de-moulded and dried at 60°C, 20% RH in a Vötsch climatic chamber for 12 hours. Preparation included cutting off the edges using a bandsaw to expose the core and produce samples 114 – 122 mm in length and width.
- 15 The results of water absorption tests are shown in Table 2. The results of wet strength tests are shown in Table 3.

TABLE 2

Ref	Hydraulic powder	Water repellent additive	Average dry density (kg/ m ³)	Water uptake (%)			
				2 hrs	24 hrs	72 hrs	240 hrs
2	β plaster	Polmethyl hydrogensiloxane	709	2.7	40.3	51.8	64.4
3.1	α plaster + CSA (9:1)	None	846	15.2	15.9	16.2	17.1
3.2		0.25% Wacker BS1260	823	6.1	9.8	11.9	15.9
3.3		0.5% Wacker BS1260	793	4.7	5.8	6.8	9.7

TABLE 3

Ref	Hydraulic powder	Water repellent additive	Wet strength (Average; N)	Wet strength error (1 standard deviation; N)
2	β plaster	Polmethyl hydrogensiloxane	18.7	1.3
3.1	α plaster + CSA (9:1)	None	120.6	11.6
3.2		0.25% Wacker BS1260	95.7	6.4
3.3		0.5% Wacker BS1260	99.4	10.0

5

Water absorption test

The water absorption test was done on by immersing the samples in tap water at 23°C such that a head of water of 30 mm between the top of the sample and water line was maintained. After given time periods the samples were removed and the excess water blotted before re-weighing. The method used was the same as that given in EN520: 2004 section 5.9.2, but the sample size was smaller and longer immersion times than 2 hours were used to demonstrate the improved water resistance of the invention. Example 1 results are averages from triplicate measurements, whereas Examples 2 and 3 are from duplicate measurements.

Wet strength test

The wet strength of the samples immersed for 240 hours (that is, saturated samples) was determined using a method similar to ASTM-C 473 section 12 for core and edge hardness measurements of gypsum panels. The maximum force required to drive a 2mm diameter steel punch (ASTM-C 473 specifies 2.5mm) through 13 mm of the sample was measured with a Mecmesin force gauge at a crosshead speed of 30 mm/ min. The test was repeated around the sample edge 16 times to determine the average.

Claims

1. A method of producing a water-resistant gypsum product, in which the product is produced from a settable aqueous calcium sulphate dispersion having a water to solids ratio of less than 0.4 to 1, the dispersion having distributed therethrough lightweight hollow bodies having water-impervious surfaces; and a hydratable cement which is capable of hydration in the presence of the calcium sulphate dispersion, the hydratable cement being reactive with excess water in the dispersion, wherein the hydratable cement is present in an amount of 5 to 15%, based on the weight of hydraulic powder.
2. A method according to claim 1, wherein the hydratable cement comprises calcium sulpho aluminate.
3. A method according to claim 1 or 2, wherein the hollow bodies are of expanded polystyrene.
4. A method according to any of claims 1 to 3, wherein the hollow bodies are present in an amount of 0.5 to 2% by weight, based on the weight of hydraulic powder.
5. A method according to any of claims 1 to 4, wherein the dispersion contains an amphiphilic compound.
6. A method according to claim 5, wherein the amphiphilic compound is a soap.
7. A method according to any of claims 1 to 6, wherein the dispersion contains a water repellent agent that cures to form a hydrophobic silicone resin in an alkaline environment.
8. A method according to the invention, wherein the dispersion further contains glass fibre reinforcement.
9. A method according to any of claims 1 to 8, wherein the gypsum product has surface reinforcement.
10. A method according to any of claims 1 to 9, wherein the gypsum product is produced without externally applied heating.

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/052011

A. CLASSIFICATION OF SUBJECT MATTER INV. C04B28/14 C04B28/16 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) C04B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DD 125 405 A1 (PUSTELNICK, E.) 20 April 1977 (1977-04-20)	1,3-10
Y	page 2	2
X	----- US 2005/183632 A1 (STURRE DARYL J [US]) 25 August 2005 (2005-08-25)	1,5-8,10
Y	paragraphs [0010] - [0028]	2
Y	----- US 2006/147681 A1 (DUBEY ASHISH [US]) 6 July 2006 (2006-07-06)	2
A	the whole document	1,3-10
A	----- GB 1 418 146 A (STAMICARBON) 17 December 1975 (1975-12-17)	1
	the whole document	
	----- -/-	
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
Date of the actual completion of the international search 21 March 2011		Date of mailing of the international search report 29/03/2011
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Gattinger, Irene

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/052011

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 685 903 A (STAV ELISHA [US] ET AL) 11 November 1997 (1997-11-11) the whole document -----	1-10
A	DD 63 320 A (TRAUTVETTER ET AL) 5 August 1968 (1968-08-05) the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2010/052011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DD 125405	A1	20-04-1977	NONE
US 2005183632	A1	25-08-2005	NONE
US 2006147681	A1	06-07-2006	AR 052349 A1 14-03-2007 AU 2005323424 A1 13-07-2006 BR PI0518526 A2 25-11-2008 CA 2594067 A1 13-07-2006 CN 101090815 A 19-12-2007 EP 1831008 A2 12-09-2007 JP 2008526665 T 24-07-2008 NZ 555837 A 29-10-2010 WO 2006073540 A2 13-07-2006
GB 1418146	A	17-12-1975	AT 328950 B 12-04-1976 BE 797883 A1 08-10-1973 CH 598147 A5 28-04-1978 DE 2317392 A1 18-10-1973 FR 2179831 A1 23-11-1973 NL 7204643 A 09-10-1973
US 5685903	A	11-11-1997	AU 2601995 A 04-01-1996 CA 2191842 A1 14-12-1995 CN 1150416 A 21-05-1997 CN 1223236 A 21-07-1999 CZ 9603531 A3 16-07-1997 DE 69524451 D1 17-01-2002 DE 69524451 T2 02-05-2002 DK 797551 T3 25-02-2002 EP 0797551 A1 01-10-1997 ES 2171187 T3 01-09-2002 HK 1021366 A1 06-02-2004 IL 113587 A 09-05-1999 JP 3025906 B2 27-03-2000 JP 9511732 T 25-11-1997 NO 965124 A 02-12-1996 PL 317432 A1 14-04-1997 WO 9533698 A1 14-12-1995
DD 63320	A	NONE	

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

Pugsley, Victoria
CHAPMAN MOLONY
20 Staple Gardens
Winchester
Hampshire SO23 8SR
GRANDE BRETAGNE

CHAPMAN MOLONY
RECEIVED 28 MAR 2011
PATRIX
DIARY
MANUAL

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference P2333PC00	Date of mailing (day/month/year) 29 March 2011 (29-03-2011)
International application No. PCT/GB2010/052011	FOR FURTHER ACTION See paragraphs 1 and 4 below International filing date (day/month/year) 2 December 2010 (02-12-2010)
Applicant BPB LIMITED	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority  European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer LIEPERT-SMITH, Kirstine Tel: +49 (0)89 2399-6173
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Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P2333PC00	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/GB2010/052011	International filing date (day/month/year) 02/12/2010	(Earliest) Priority Date (day/month/year) 04/12/2009
Applicant BPB LIMITED		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

- a. the figure of the **drawings** to be published with the abstract is Figure No. _____
☐ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention
b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/052011

A. CLASSIFICATION OF SUBJECT MATTER

INV. C04B28/14 C04B28/16
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DD 125 405 A1 (PUSTELNICK, E.) 20 April 1977 (1977-04-20)	1,3-10
Y	page 2	2
X	US 2005/183632 A1 (STURRE DARYL J [US]) 25 August 2005 (2005-08-25)	1,5-8,10
Y	paragraphs [0010] - [0028]	2
Y	US 2006/147681 A1 (DUBEY ASHISH [US]) 6 July 2006 (2006-07-06)	2
A	the whole document	1,3-10
A	GB 1 418 146 A (STAMICARBON) 17 December 1975 (1975-12-17)	1
	the whole document	
	----- -/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

21 March 2011

Date of mailing of the international search report

29/03/2011

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040.
Fax: (+31-70) 340-3016

Authorized officer

Gattinger, Irene

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/052011

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 685 903 A (STAV ELISHA [US] ET AL) 11 November 1997 (1997-11-11) the whole document -----	1-10
A	DD 63 320 A (TRAUTVETTER ET AL) 5 August 1968 (1968-08-05) the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2010/052011

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DD 125405	A1	20-04-1977	NONE	
US 2005183632	A1	25-08-2005	NONE	
US 2006147681	A1	06-07-2006	AR 052349 A1 AU 2005323424 A1 BR PI0518526 A2 CA 2594067 A1 CN 101090815 A EP 1831008 A2 JP 2008526665 T NZ 555837 A WO 2006073540 A2	14-03-2007 13-07-2006 25-11-2008 13-07-2006 19-12-2007 12-09-2007 24-07-2008 29-10-2010 13-07-2006
GB 1418146	A	17-12-1975	AT 328950 B BE 797883 A1 CH 598147 A5 DE 2317392 A1 FR 2179831 A1 NL 7204643 A	12-04-1976 08-10-1973 28-04-1978 18-10-1973 23-11-1973 09-10-1973
US 5685903	A	11-11-1997	AU 2601995 A CA 2191842 A1 CN 1150416 A CN 1223236 A CZ 9603531 A3 DE 69524451 D1 DE 69524451 T2 DK 797551 T3 EP 0797551 A1 ES 2171187 T3 HK 1021366 A1 IL 113587 A JP 3025906 B2 JP 9511732 T NO 965124 A PL 317432 A1 WO 9533698 A1	04-01-1996 14-12-1995 21-05-1997 21-07-1999 16-07-1997 17-01-2002 02-05-2002 25-02-2002 01-10-1997 01-09-2002 06-02-2004 09-05-1999 27-03-2000 25-11-1997 02-12-1996 14-04-1997 14-12-1995
DD 63320	A		NONE	

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No PCT/GB2010/052011	International filing date (day/month/year) 02.12.2010	Priority date (day/month/year) 04.12.2009
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International Patent Classification (IPC) or both national classification and IPC
INV. C04B28/14 C04B28/16

Applicant
BPB LIMITED

1. This opinion contains indications relating to the following items:

☒ Box No. I Basis of the opinion

☐ Box No. II Priority

☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

☐ Box No. IV Lack of unity of invention

☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

☐ Box No. VI Certain documents cited

☐ Box No. VII Certain defects in the international application

☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	Date of completion of this opinion see form PCT/ISA/210	Authorized Officer Gattinger, Irene Telephone No. +49 89 2399-6097
--	--	--



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
- a. (means)
- ☐ on paper
 - ☐ in electronic form
- b. (time)
- ☐ in the international application as filed
 - ☐ together with the international application in electronic form
 - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>2, 5-7</u>
	No: Claims	<u>1, 3, 4, 8-10</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-10</u>
Industrial applicability (IA)	Yes: Claims	<u>1-10</u>
	No: Claims	

2. Citations and explanations

see separate sheet

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/GB2010/052011

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 DD 125 405 A1 (PUSTELNICK, E.) 20 April 1977

D2 US 2005/183632 A1 (STURRE DARYL J [US]) 25 August 2005

D3 US 2006/147681 A1 (DUBEY ASHISH [US]) 6 July 2006

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 3, 4 as well as 8 to 10 is not novel in the sense of Article 33(2) PCT.

2.1 Document D1 discloses a method for producing gypsum products such as sheet-covered boards, the core composition comprising stucco, Portland cement and expanded polystyrene beads (page 2), the amounts falling into the scope of independent claim 1, which is therefore not novel in light of D1. D1 is also considered novelty-destroying for the subject-matter of dependent claims 3, 4 as well as 9 and 10.

2.2 Document D2 discloses a method for producing a moulded, lightweight composition from a mixture comprising foam beads, stucco and Portland cement ([0011]), the amounts falling into the scope of independent claim 1, which is therefore also not novel in view of D2. D2 is also considered novelty-destroying for the subject-matter of dependent claims 8 and 10.

3 Dependent claims 2 as well as 5 to 7 do not appear to contain any additional features which, in combination with the features of claim 1 to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:

- 3.1 The combination of stucco with calcium sulfoaluminate cements is known to the skilled man in the context of preparation of panels from e.g. D3. No further technical improvement with respect to the combination of stucco / Portland cement has been shown in the present application, which would justify an inventive step.
- 3.2 The addition of soaps or silicone forming admixtures in order to further increase the water resistance is commonly known to the skilled man in the field of cementitious or gypsum boards (see for example documents cited in the search report). Unexpected effects or properties are not demonstrated in the present application.

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because claim 1 is not clear.

Claim 1 defines the amount of hydratable cement with respect to a "hydraulic powder", which, however, is not defined in present claim 1. A suitable definition appears to be on page 2; lines 13-17.

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information

For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.

Amending claims under Art. 19 PCT

Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.

Filing a demand for international preliminary examination

In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT).

If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).

Filing informal comments

After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.

End of the international phase

At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).

Relevant PCT Rules and more information

Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003



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PATENTE DE INVENCION ☐

MODELO DE UTILIDAD ☐

Art 33 Decisión 486/00

☐	Indicación que se solicita una patente.
☐	Datos de identificación del solicitante o de la persona que presenta la solicitud
☐	Descripción de la invención
☐	Dibujos de ser estos pertinentes
☐	Comprobante de pago de las tasas establecidas (De ser el caso formato de descuento)
Completa ☐	Incompleta ☐

PATENTE DE INVENCION PCT ☒

MODELO DE UTILIDAD PCT ☐

Art.33 Decisión 486/00, Circular Única

☒	Indicación que se solicita una PCT
☒	Copia de la solicitud en español, tal como fue presentada inicialmente (capítulo descriptivo, reivindicatorio, resumen)
☐	Dibujos de ser estos pertinentes
☐	Comprobante de pago de las tasas establecidas (de ser el caso formato de descuento)
Completa ☐	Incompleta ☐

DISEÑO INDUSTRIAL ☐

(Art. 119 Decisión 486/00)

☐	Indicación que se solicita Diseño industrial
☐	Datos de identificación del solicitante o de la persona que presenta la solicitud
☐	Representación gráfica y fotográfica del Diseño industrial o muestra del material que incorpora el diseño
☐	Comprobante de pago de las tasas establecidas
Completa ☐	Incompleta ☐

ESQUEMA DE TRAZADO ☐

(Art. 92 Decisión 486/00)

☐	Indicación que se solicita un esquema de trazado
☐	Datos de identificación del solicitante o de la persona que presenta la solicitud
☐	Representación gráfica de un esquema de trazado
☐	Comprobante de pago de las tasas establecidas
Completa ☐	Incompleta ☐