

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

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/EP2022/069450

International filing date (day/month/year)
12.07.2022

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13.07.2021

International Patent Classification (IPC) or both national classification and IPC
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Applicant
AKZO NOBEL COATINGS INTERNATIONAL B.V.

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.

Name and mailing address of the ISA:



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Date of completion of
this opinion

see form
PCT/ISA/210

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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 43*bis*.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:
 - a. ☐ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13*ter*.1(a)),
 - ☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
4. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.
5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.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>1-15</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-15</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-15</u>
	No: Claims	

2. Citations and explanations

see separate sheet

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

Reference is made to the following documents:

D1 EP 1 072 620 B1 (BASF AG [DE]) 21 September 2005 (2005-09-21)

D2 US 2021/024795 A1 (SCHMATLOCH STEFAN [CH] ET AL) 28 January
2021 (2021-01-28)

The applicant has requested to have the present application processed under PCT Direct (PCT-EPO Guidelines B-IV, 1.2.1). Account taken of the applicant's comments submitted with the PCT Direct letter of 12 July 2022, this Authority considers that the present application does meet the criteria of Articles 33(2) and 33(3) PCT, the subject-matter of claims 1-15 being considered novel and inventive. The justification is given below.

2. NOVELTY (Article 33(2) PCT)

2.1 Document **D1** discloses (see D1, pages 8-9, par. 0063-68, table 1, ex. 3-5) a one-component moisture-curable adhesive composition comprising an isocyanate-functional prepolymer obtainable by reacting:

(a) one or more polyisocyanates comprising methyl diphenyl diisocyanate; and

(b) a polyol mixture comprising:

(b1) a linear polypropylene glycol with two primary hydroxyl groups, having a mean molecular weight of 1,000; and

(b2) a polyether triol, such as the amine-based polyether triol having a mean molecular weight of 4,000,

wherein the content of free isocyanate groups in the adhesive composition is in the range of from 14 to 17 wt.%, namely 15 wt.%.

D1 is silent about the use of the specific polyol mixture of the present application, which comprises:

(b1) a linear butylene oxide-based diol with two primary hydroxyl groups; and

(b2) a polyether triol with three secondary hydroxyl groups

wherein in the range of from 55 to 75% of the hydroxyl groups in polyol mixture (b) are hydroxyl groups from butylene oxide-based diol (b1) wherein the equivalent ratio between isocyanate groups in (a) and hydroxyl groups in (b) is in the range of from 3.5 to 7.0.

Moreover, the polyol mixture disclosed in D1 has an OH number of 73 mg KOH/g (see D1, page 8, par. 0063), which is different of the one which can be calculated from the present application ex. 2, page 14, namely, a OH number of 134. More, D1 discloses also that the polyether polyol preferably has primary hydroxyl groups (see D1, page 6, par. 0048-49).

Thus, the subject-matter of claims 1-15 seems to be novel over D1.

2.2 Document **D2** discloses (see D2, pages 8, table 1, ISO 1, ISO 7; page 7, par. 0067, 0069, 0074 and 0077) a two-component polyurethane adhesive composition comprising an isocyanate-functional prepolymer obtainable by reacting:

(a) one or more polyisocyanates comprising methyl diphenyl diisocyanate, such as: Isonate M143, which is a modified liquid MDI product having an isocyanate functionality of about 2.2, or

Isonate OP 50, which is an asymmetric ortho, para methylene diphenyl diisocyanate with equivalent weight of 125.5 g/mol and an isocyanate content of 33.5%; and

(b) a polyol mixture comprising:

(b1) a linear butylene oxide-based diol with two primary hydroxyl groups, such as Vorapel™ D3201, which is a hydrophobic polyol based on a hydrophobically modified (polybutyleneoxide)diol, with an average molecular weight of 1921 g/mol to 2125 g/mol; and

(b2) a polyether triol, such as Voranol CP4711, which is a glycerin initiated propoxylated and ethoxylated based triol with an average equivalent molecular weight of 1603 g/mol;

wherein the content of free isocyanate groups in the adhesive composition is in the range of from 14 to 17 wt%, indeed D2 discloses (see D2, page 9, claim 2) that the prepolymer has a free isocyanate content of from 1 wt. % to 20 wt. %. According to the one selection rule it is allowable to choose from the range of 1-20 wt. %, the value of 15 wt. %.

Note: VORANOL™ CP 4711 Polyol it is defined as a well-adjusted design of primary hydroxyl group content providing a balance between initial reactivity and final curing.

(see <https://www.dow.com/content/dam/dcc/documents/en-us/productdatasheet/400/400-00101430en-voranol-cp-4711-polyol-tds.pdf>)

Moreover, document US2017240685 (see page 3, par. 0021, Polol B) defines the VORANOL™ CP 4711 as a glycerine initiated propoxylated-ethoxylated polyether triol, having ethylene oxide capping, so, primary hydroxyl groups.

Thus, D2 does not disclose the use of a polyether triol with three secondary hydroxyl groups because an undefined amount of the end groups are primary hydroxyl groups. Since the polyether triol with three secondary hydroxyl groups is missing from the composition, it is not possible to calculate for D2 the percentage content of the hydroxyl groups from butylene oxide-based diol (b1) in the polyol mixture (b), under the rule set in claim 1 of the present application.

Yet, the above mentioned composition allows to calculate a value of only 28% of hydroxyl groups from butylene oxide-based diol (b1) in the polyol mixture of D2. Such a value does not fall in the range of 55 to 75%, as requested by the present claim 1.

Hence, D2 is silent about the use of:

- the above mentioned composition as one-component moisture-curable adhesive;
- a polyether triol with three secondary hydroxyl groups, and
- the condition: “wherein in the range of from 55 to 75% of the hydroxyl groups in polyol mixture (b) are hydroxyl groups from butylene oxide-based diol (b1)”.

Thus, the subject-matter of claims 1-15 seems to be novel over D2.

3. INVENTIVE STEP (Article 33(3) PCT)

3.1 Closest prior art

Considering the above mentioned at point 2.1 and the fact that the moisture-curable adhesive composition disclosed in D1 is used for the fabrication of glued laminated wood (see D1, pages 4-5, par. 0030-0033) and because D1 aims to provide minimum pressing times according to DIN 68141 in the range of 15 to 150 minutes (see D1, page 4, par. 0021, (E)), D1 is considered as the closest prior art.

3.2 Distinguishing feature: the use of a specific polyol mixture comprising the well-defined amount of 55 to 75% of primary hydroxyl groups coming from a linear butylene oxide-based diol, in a mixture with a polyether triol with three secondary hydroxyl groups.

Contrary to the present application, D1 favours the use of polyether polyols having primary hydroxyl groups (see D1, page 6, par. 0048-49; page 8, par. 0063) in a polyol mixture which is lacking both the linear butylene oxide-based diol and the polyether triol with three secondary hydroxyl groups.

3.3 Effect of the difference

D1 provides adhesive compositions with a minimum pressing time of 0.5 and 2 hours and the closed assembly time is not precisely disclosed (see D1, page 9, table 1, ex. 3-5). While, the present application provides adhesive compositions with a minimum pressing time (PT) of 12 and 15 minutes and closed assembly time (AT) of 5 and 8 minutes, which gives AT/PT ratios of 1 : 2.4 and 1 : 1.9.

3.4 The objective technical problem to be solved by the present invention is to provide one-component moisture-curing polyurethane adhesive compositions that combine a favourable AT/PT ratio with good mechanical properties.

3.5 Why is it inventive

The teachings of D1 and D2 are not hinting to the solution proposed by the present application, moreover a surprising effect is obtained, namely, a minimum pressing time (PT) of 12 and 15 minutes and assembly time (AT) of 5 and 8 minutes, which gives AT/PT ratios of 1 : 2.4 and 1 : 1.9.

Furthermore, the solution to the above problem cannot be seen as obvious on the basis of the common technical knowledge or by combining the teachings of D1 with D2.

3.6 For these reasons the subject-matter of claim 1 (and implicitly that of claims 2-15) is considered to involve an inventive step in the sense of Article 33(3) PCT.

Re Item VIII

Certain observations on the international application

One typographical error is present in claim 1, for the component b2 – the l is missing from polyether triol.