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**Datasheet for the decision
of 14 July 2011**

Case Number: T 1810/08 - 3.3.09

Application Number: 98905961.3

Publication Number: 0953026

IPC: C09J 175/04

Language of the proceedings: EN

Title of invention:

A polyurethane latex pressure sensitive adhesive and process
for making same

Patentee:

Dow Global Technologies LLC

Opponent:

BASF SE

Headword:

-

Relevant legal provisions:

EPC Art. 84, 123(2), 83, 54, 56
RPBA Art. 13(1)

Relevant legal provisions (EPC 1973):

-

Keyword:

"Amendments - Clarity (no, main request, auxiliary requests 1,
3, 4 and 6)"
"Amendments - added subject-matter (yes, auxiliary requests 2,
3, 4 and 6)"
"Reformatio in peius (yes, auxiliary requests 3, 4 and 6)"
"Admissibility into the proceedings (no, auxiliary request 5)"
"Novelty and inventive step (yes, auxiliary request 7)"

Decisions cited:

G 0004/93, G 0001/99, T 1129/97

Catchword:

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Case Number: T 1810/08 - 3.3.09

D E C I S I O N
of the Technical Board of Appeal 3.3.09
of 14 July 2011

Appellant: BASF SE
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
26 August 2008 concerning maintenance of
European patent No. 0953026 in amended form.

Composition of the Board:

Chairman: W. Sieber
Members: M. O. Müller
K. Garnett

Summary of Facts and Submissions

- I. This decision concerns the appeal by the opponent against the interlocutory decision of the opposition division that the auxiliary request filed by the proprietor during oral proceedings on 19 October 2006 meets the requirements of the EPC.
- II. In the notice of opposition, the opponent requested revocation of the patent in its entirety on the grounds that the claimed subject-matter lacked novelty and inventive step and that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Articles 100(a) and (b) EPC).

The documents cited during the opposition procedure included

D1: EP 0 615 988 A1.

- III. The interlocutory decision of the opposition division, which was announced orally on 19 October 2006 and issued in writing on 26 August 2008, was based on a main request filed with letter of 9 August 2006 and an auxiliary request filed during the oral proceedings before the opposition division.

The auxiliary request contained 21 claims of which claim 1 read as follows:

"1. A polyurethane latex composition, said composition comprising a polyurethane aqueous dispersion prepared from a formulation which includes high molecular weight

monols and/or a stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules and which contains less than 20 percent pendant chains by weight based on total weight of solids, said polyurethane aqueous dispersion being free of volatile solvent and being suitable for being dried to form a pressure sensitive-adhesive composition".

With regard to the auxiliary request, the opposition division held *inter alia* as follows:

The amendments in the auxiliary request met the requirements of Article 123(2) EPC.

The invention according to the auxiliary request was moreover sufficiently disclosed. On the basis of the examples in the opposed patent, it was plausible that the use of polyurethanes fulfilling the structural requirements of claim 1 led to pressure-sensitive adhesive compositions. The skilled person therefore would be able to achieve the envisaged result without an undue amount of experimentation.

The subject-matter of the auxiliary request was furthermore novel in view of D1 *inter alia* as this document did not disclose any polyurethanes prepared with a stoichiometric excess of polyol.

The subject-matter of the auxiliary request was also inventive. D1 formed the closest prior art and there was neither an indication in this document that the polyurethane compositions described therein were useful as pressure sensitive adhesives nor did this document

give an indication how these polyurethanes could be modified to improve their suitability for this application.

IV. On 18 September 2008, the appellant (opponent) filed a notice of appeal against the above decision and paid the prescribed fee on the same day. A statement setting out the grounds of appeal was filed on 19 November 2008 together with:

D3: US 5,591,820 A1;

D4: US 3,437,622 A1;

D5: EP 0 884 336 A1; and

D6: "Chemistry and Technology of Polyols for Polyurethanes", Rapra Technology Limited, 2005, pages 66-69.

V. With letter of 14 April 2009, the respondent (proprietor) filed a reply to the appeal together with an adapted page 4 of the description of the opposed patent.

VI. On 7 February 2011, the preliminary opinion of the board was communicated to the parties together with the summons to oral proceedings.

VII. In reply thereto, the respondent filed, with letter of 14 June 2011, a new main request and auxiliary requests 1-7 together with

D7: Excerpt from Google Books from 28 April 2011.

VIII. Also with letter of 14 June 2011, the appellant filed

D8: "Datenblatt 1" on "PAPI Polymeric MDI" (Dow);

D9: "Datenblatt 2" on "PAPI 94" (Dow);

D10: "Datenblatt 3" on "Dow MDI-Based Products";

D11: "Datenblatt 4" on "ISONATE 181" (Dow); and

D12: "Kunststoff-Lexikon", W. Woebcken (editor),
9th edition, Carl Hanser Verlag München, Wien,
1998, pages 262-263.

IX. On 14 July 2011, oral proceedings were held before the board. The respondent maintained the main request and auxiliary requests 1-4 and 6 as filed with letter of 14 June 2011 and filed new auxiliary requests 5 and 7 as a substitute for previous auxiliary requests 5 and 7. The appellant requested that new auxiliary request 5 should not be admitted into the proceedings. The claims of the final requests are *inter alia* as follows:

(a) Claim 1 of the main request:

"1. A polyurethane latex composition, said composition comprising a polyurethane aqueous dispersion prepared from a formulation which includes high molecular weight monols and/or a stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules and which contains less than 20 percent pendant

chains by weight based on total weight of solids, said polyurethane aqueous dispersion being free of volatile solvent and being suitable for being dried to form a pressure sensitive-adhesive composition".

(b) In the same way as in the main request, claim 1 of auxiliary request 1 contains the requirement that the pressure sensitive-adhesive composition is tacky "due to being prepared from a formulation which includes high molecular weight monols".

(c) This has been replaced in claim 1 of auxiliary request 2 by the requirement that the pressure sensitive-adhesive composition "is tacky due to being prepared from a formulation which includes monols with a molecular weight of 600 or more atomic mass units".

(d) Claim 1 of auxiliary request 3:

"1. A polyurethane latex composition, said composition comprising a polyurethane aqueous dispersion said polyurethane aqueous dispersion being free of volatile solvent molecules and which contains less than 20 percent pendant chains by weight based on total weight of solids and being suitable for being dried to form a pressure sensitive-adhesive composition which is tacky due to being prepared by including a mono-functional active hydrogen oligomer with the reactants during the synthesis of the prepolymer or alternately reacting the oligomer with the prepolymer after the prepolymer has been prepared and/or a

stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules".

- (e) Claim 1 of auxiliary request 4 is identical to claim 1 of auxiliary request 3 except that the wording "which is tacky due to" has been replaced by the formulation

"which

- a) when at the interface of two surfaces, causes the surfaces to remain joined together,
- b) having limited adhesive strength, such that most materials adhering to a substrate coated with such pressure sensitive adhesive composition can be separated from the substrate without tearing or deforming the material or the coated substrate,
- c) retaining adhesive properties after repeated uses, and
- d) being non-transferable due to".

- (f) Claim 1 of auxiliary request 5:

"1. A polyurethane latex composition, said composition comprising a polyurethane aqueous dispersion said polyurethane aqueous dispersion being free of volatile solvent and which contains less than 20 percent pendant chains by weight based on total weight of solids and being suitable for being dried to form a pressure sensitive-adhesive composition which is tacky due to using prepolymer having pendant groups which can become

pendant chains in the dehydrated polyurethane PSA polymer, such prepolymers being formed by including a monol derived from polyalkylene oxides with the reactants during the synthesis of the prepolymer or, alternatively, reacting a monol derived from polyalkylene oxide with the prepolymer after the prepolymer has been formed".

(g) Claim 1 of auxiliary request 6 is identical to claim 1 of auxiliary request 3 except that it contains the additional feature "and wherein substrates coated with the polyurethane pressure sensitive adhesive composition exhibit peel strength build of less than 400 percent".

(h) Auxiliary request 7 contains 21 claims of which claims 1, 4, 12 and 21 are independent claims which read as follows:

"1. A polyurethane latex composition, said composition comprising a polyurethane aqueous dispersion prepared from a formulation which includes a stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules and which dispersion contains less than 20 percent pendant chains by weight based on total weight of solids, said polyurethane aqueous dispersion being free of volatile solvent and being suitable for being dried to form a pressure sensitive-adhesive composition"

"4. A substrate having a pressure-sensitive-adhesive coating affixed to at least a portion of

said substrate, said pressure-sensitive-adhesive coating comprising a pressure-sensitive-adhesive composition that contains less than 20 percent by weight pendant chains based on total weight of solids, said pressure-sensitive-adhesive composition being obtainable by drying a polyurethane aqueous dispersion according to claims 1, 2 or 3"

"12. A pressure-sensitive adhesive composition, said composition comprising less than 20 percent by weight pendant chains based on total weight of solids, said pressure-sensitive-adhesive composition being obtainable by drying a polyurethane aqueous dispersion according to claims 1, 2 or 3"

"21. A process for preparing a substrate having a pressure-sensitive-adhesive coating affixed to at least a portion of said substrate, said process comprising:

A. applying a polyurethane aqueous dispersion according to claim 1, 2 or 3 to at least a portion of a substrate, and said polyurethane aqueous dispersion being obtainable by:

- 1) emulsifying a polyurethane prepolymer in water, said polyurethane prepolymer having at least one unreacted functional group; and
- 2) chemically reacting substantially any unreacted functional group; and

B. dehydrating said polyurethane aqueous dispersion and obtaining a pressure-sensitive-adhesive composition".

X. The appellant's arguments, in as far as relevant to the present decision, were as follows:

- (a) The main request and auxiliary request 1 did not meet the requirements of Article 84 EPC as the term "high molecular weight monols" in claim 1 of these requests was unclear. There was in particular no information present in the claims or description of the opposed patent that could assist the skilled person in distinguishing between low and high molecular weight monols.
- (b) Auxiliary request 2 did not meet the requirements of Article 123(2) EPC as the molecular weight of "600 or more atomic mass units" in claim 1 was not disclosed in and could not be derived from the application as filed.
- (c) Auxiliary request 3 contravened the prohibition of *reformatio in peius* since, by way of replacing the term "monols" by the wording "mono-functional active hydrogen oligomer", claim 1 of this request had been broadened with regard to the corresponding claim held allowable by the opposition division.

Auxiliary request 3 moreover did not meet the requirements of Article 84 EPC in particular as the molecular weight of the term "oligomer" was unclear. This term did not, as alleged by the respondent, represent a high molecular weight compound as the opposed patent referred to low molecular weight oligomers in paragraph [0036].

In addition, auxiliary request 3 violated the requirements of Article 123(2) EPC as the feature of including the mono-functional active hydrogen oligomer with the reactants during the synthesis of the prepolymer was disclosed in the application as filed only for emulsified isocyanate terminated prepolymers.

- (d) The same objections as regards auxiliary request 3 applied to auxiliary requests 4 and 6.
- (e) Auxiliary request 5 should not be admitted into the proceedings as this request was filed late and as time was needed to examine this request with regard to the requirements of Articles 83, 84 and 123(2) EPC.
- (f) Auxiliary request 7 contravened the prohibition of *reformatio in peius* as claim 1 had been broadened by way of deleting the monol alternative.

No objections were raised against auxiliary request 7 with regard to Articles 84 and 123(2) EPC.

Auxiliary request 7 was not sufficiently disclosed. In particular, the amount of pendant chains required by claim 1 of this request was unclear as the claim and description were contradictory in this respect and as the skilled person could not distinguish between pendant chains and the main chain if both were formed of polyurethane. Moreover, according to the description of the opposed patent, the polyol

excess required by claim 1 covered isocyanate indexes in the range of 10 to 100. As evidenced by D4, not all isocyanate indexes embraced by this range led to pressure sensitive adhesives. A research program was thus needed in order to identify those isocyanate indexes at which the invention could be carried out. Furthermore, when using a blend of an excess of polyol together with monols, it was impossible to obtain polyurethane chains that were terminated by polyol chains as required by claim 1 of auxiliary request 7. Finally, it would not be clear to the skilled person whether the invention underlying the opposed patent concerned compositions or pure polymers as at least ten different terms were used in the opposed patent in this context.

Both D5, which was prior art under Article 54(3) EPC, and D1 were novelty-destroying for auxiliary request 7. In particular, the water used in example 1 of the two documents constituted a polyol. This was confirmed by the fact that water was given in the opposed patent as an example of a chain extender having two or more hydroxyl groups. With water as additional polyol, the polyol amount in the examples of D1 and D5 was in excess of the polyisocyanate amount and hence was as required by claim 1 of auxiliary request 7.

With regard to inventive step D1 or D4 could be used as closest prior art. The claimed subject-matter differed from D4 in that the pressure sensitive adhesive was based on an aqueous polyurethane dispersion, contrary to the solvent-

based system of D4. The problem was the provision of pressure sensitive adhesives based on solvent-free systems. D1 already pointed at the disadvantages of solvent-based systems and proposed aqueous polyurethane dispersions as a solution. It had been demonstrated during the oral proceedings before the opposition division that these dispersions were suitable as pressure sensitive adhesives. The claimed subject-matter thus would have been obvious in view of D4 in combination with D1.

XI. The respondent's arguments, in so far as relevant to the present decision, were as follows:

- (a) The invention consisted in the use of monols or a polyol excess for the preparation of an aqueous polyurethane dispersion. In the polar aqueous system, the polar monol or the polar hydroxyl groups of unreacted polyol chain ends would be located at the surface of the polyurethane particles present in the dispersion such that they extend into the polar aqueous phase. Upon drying, the polyurethane would thus have polar monol or unreacted polyol groups at the surface which led to tackiness due to hydrogen bonding.

- (b) The term "high molecular weight monols" in the main request and auxiliary request 1 was clear. This term was frequently used in the art and it clearly followed from the description of the opposed patent that low molecular weight monols had a molecular weight of less than 600 atomic mass units. The term "high molecular weight

monols" thus could only imply a molecular weight of 600 or more atomic mass units.

- (c) The molecular weight introduced into claim 1 of auxiliary request 2 was based on the application as filed. It could in particular be deduced from the application as filed that low molecular weight monols had a molecular weight of less than 600 atomic mass units and this implied a molecular weight of 600 or more atomic mass units for high molecular weight monols.
- (d) Auxiliary request 3 did not violate the prohibition of *reformatio in peius*. The replacement of monols by mono-functional active hydrogen oligomers had been carried out in response to an objection issued by the board and thus belonged to the exceptions referred to in G1/99 as not contravening the prohibition of *reformatio in peius*.

The term "oligomer" in claim 1 of auxiliary request 3 was clear. This term implied a high molecular weight compound for which a molecular weight of 600 or more atomic mass units could be derived from the description of the opposed patent.

- (e) Auxiliary request 5 should be admitted into the proceedings as it constituted a reaction to objections raised with regard to auxiliary request 3 and as, furthermore, the amendment carried out in new auxiliary request 5 was based on the examples of the opposed patent and hence could have been expected by the appellant. The

terms "pendant groups" and "pendant chains" in claim 1 of this request both referred to the monols. These monols constituted pendant groups, which during dehydration of the polyurethane, changed their spatial arrangement and thereby became pendant chains.

- (f) Auxiliary request 7 did not violate the prohibition of *reformatio in peius* as the deletion of an alternative in a claim restricted rather than broadened the claim.

The objections raised by the appellant under Article 83 EPC in fact represented clarity objections. Irrespective of this, the amount of pendant chains was clear as it was expressed relative to the dry weight of the aqueous dispersion in both claim 1 and the description of the opposed patent. D4 did not establish that the invention could not be carried out at certain isocyanate indexes. More particularly, solvent-based systems were used in D4 and hence no conclusion could be drawn on the basis of this document with regard to the chemically different aqueous systems of the opposed patent.

Auxiliary request 7 was novel in view of D1 and D5. Water could not be considered to represent a polyol and hence neither D1 nor D5 disclosed the use of a polyol excess.

With regard to inventive step, D4 could be considered to represent the closest prior art. The subject matter of claim 1 differed from this

document in that an aqueous polyurethane dispersion instead of the solvent-based system of D4 was used. The problem was the provision of a pressure sensitive adhesive based on a solvent-free system. D1 disclosed adhesives with high adhesive strength. The skilled person would thus assume that by combining D4 with D1 he would not obtain a pressure sensitive adhesive. Moreover the pressure sensitive adhesive could contain still-unreacted isocyanate groups. These would lead to an increase of peel strength over time, contrary to what was aimed at in the opposed patent. It followed from D1 and D7 that the pressure sensitive adhesives of D4 still contained residual solvent after drying, unlike the adhesive referred to in claim 4. Therefore, the same argumentation that was valid for claim 1 also applied to claim 4 of auxiliary request 7.

XII. During oral proceedings, the board raised the following points in addition to the arguments brought forward by the parties:

Auxiliary request 3 did not meet the requirements of Article 123(2) EPC as the use of both monols and an excess of polyols to prepare the aqueous polyurethane dispersion was not originally disclosed.

Auxiliary request 5 was not clearly allowable and therefore could not be admitted into the proceedings. More particularly, the request did not meet the requirements of Article 84 EPC as it was not clear what kind of change was implied by the wording "pendant groups which can become pendant chains" in claim 1 of

this request. Moreover, this claim did not meet the requirements of Article 123(2) EPC as, contrary to the application as filed, the polyalkylene oxide monols were not restricted to oligomers.

XIII. The appellant (opponent) requests that the decision under appeal be set aside and the European patent No. 0 953 026 be revoked.

XIV. The respondent (proprietor) requests that the decision under appeal be set aside and the patent be maintained on the basis of the main request, alternatively on the basis of auxiliary requests 1-4, all filed with the letter dated 14 June 2011, or on the basis of auxiliary request 5 filed during the oral proceedings, or on the basis of auxiliary request 6 filed with the said letter, or on the basis of auxiliary request 7 filed during the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

Main request and auxiliary request 1

2. *Amendments - Clarity*

2.1 Claim 1 of the main request and auxiliary request 1 refers to a polyurethane latex composition comprising a polyurethane aqueous dispersion. By way of amendment after grant, the requirement has been introduced into claim 1 of both requests that this dispersion has to be prepared "from a formulation which includes high

molecular weight monols". Since the amendment has been made after grant and is based on a passage from the description (page 11, lines 33-34 as filed), it has to be examined whether the amendment meets the requirements of Article 84 EPC.

- 2.2 There is no information in claim 1 of the two requests as to what molecular weights are embraced by the term "high molecular weight". Moreover, no evidence was provided by the respondent to establish that the skilled person, on the basis of his common general knowledge, would know what molecular weights are covered by this term.
- 2.3 The respondent argued that the term "high molecular weight" was defined in the description of the opposed patent and that, on the basis of this definition, the term in claim 1 was clear. The respondent in particular relied on the statement in paragraph [0038] of the opposed patent that the molecular weight of a low molecular weight mono-functional active hydrogen compound is less than 600 atomic mass units. The respondent argued that this definition of low molecular weight could only mean that the term "high molecular weight" in claim 1 of both requests referred to a molecular weight of 600 or more atomic mass units.

However, as is confirmed by decision T 1129/97 (in particular points 2.1.2. and 2.1.3), it is the claim as such that has to be clear. For this reason alone, the respondent's argument must fail.

Moreover, it cannot be excluded that an intermediate molecular weight range exists in between the low

molecular weight of less than 600 atomic mass units disclosed in the description of the opposed patent and the high molecular weight referred to in claim 1 of both requests. Consequently, the respondent's assumption that high molecular weights start where low molecular weights end does not necessarily hold true. No definition of high molecular weights can thus be derived from the description of the opposed patent. Also for this reason, the respondent's argument cannot succeed.

- 2.4 Therefore, claim 1 of the main request and auxiliary request 1 lacks clarity with regard to the term "high molecular weight monols". These requests thus are not allowable.

Auxiliary request 2

3. *Amendments - Article 123(2) EPC*

- 3.1 In order to meet the clarity objection with regard to the term "high molecular weight monol", the respondent specified the monols as having "a molecular weight of 600 or more atomic mass units" in claim 1 of auxiliary request 2.

The application as filed nowhere discloses a molecular weight of 600 or more atomic mass units. As with the main request and auxiliary request 1 (point 2.3 above), the respondent argued that this molecular weight could be derived from the molecular weight of less than 600 atomic mass units given for the low molecular weight mono-functional active hydrogen compounds on page 7, lines 30-32 of the application as filed.

As has however already been set out above (point 2.3), the fact that low molecular weight mono-functional active hydrogen compounds have a molecular weight of less than 600 atomic mass units does not necessarily imply that high molecular weight monols must have a molecular weight of 600 or more atomic mass units. Hence, such a molecular weight cannot be clearly and unambiguously derived from the application as filed.

- 3.2 For the above reasons, the inclusion of the feature "monols with a molecular weight of 600 or more atomic mass units" in claim 1 of auxiliary request 2 contravenes the requirements of Article 123(2) EPC. The second auxiliary request is therefore not allowable.

Auxiliary request 3

4. *Amendments*

- 4.1 The prohibition of *reformatio in peius* implies that an amendment effected during appeal proceedings, which would put the opponent and sole appellant in a worse situation than if it had not appealed, must be rejected (G 4/93 and G 1/99). Therefore, in appeal proceedings where the opponent is the sole appellant, claim amendments that broaden the claim with regard to the corresponding claim found allowable by the opposition division are normally to be rejected. Where a patent which has been maintained in amended form would however have to be revoked as a direct consequence of an inadmissible amendment held allowable by the opposition division, the respondent (proprietor), without

violating the prohibition of *reformatio in peius*, may be allowed to file requests, as follows:

- (a) in the first place, with an amendment introducing one or more originally disclosed features which limit the scope of the patent as maintained;
- (b) if such a limitation is not possible, with an amendment introducing one or more originally disclosed features which extend the scope of the patent as maintained, but within the limits of Article 123(3) EPC;
- (c) finally, if such amendments are not possible, with a deletion of the inadmissible amendment, but within the limits of Article 123(3) EPC (see the headnote of G 1/99).

4.1.1 In the present case, the feature "... prepared by including a mono-functional active hydrogen oligomer ..." was substituted in claim 1 of auxiliary request 3 for the feature "... prepared from a formulation which includes high molecular weight monols ..." in claim 1 of the request found allowable by the opposition division.

It is thus a **mono-functional active hydrogen** oligomer rather than a high molecular weight **monol** that is to be used as reactant according to claim 1 of auxiliary request 3. Apart from monols, the term "mono-functional active hydrogen oligomer" additionally covers eg mono-functional amines or thiols. This implies that by the amendment of claim 1 of auxiliary request 3, this claim has been broadened with regard to claim 1 of the

request found allowable by the opposition division. This amendment thus puts the appellant (opponent) in a position that is worse than it was in under the contested decision. The amendment therefore goes against the prohibition of *reformatio in peius*.

- 4.1.2 The respondent argued that the amendment had been carried out in order to meet the board's objection under Article 84 EPC raised against the term "high molecular weight monols". Therefore, in the respondent's view, the amendment corresponded to one of the three options considered in G 1/99 not to violate the principle of *reformatio in peius*.

As has been set out above, this claim, by way of the amendment in claim 1 of auxiliary request 3, has been broadened compared to claim 1 of the request held allowable by the opposition division. The respondent's amendment thus corresponds to the second option referred to in G 1/99.

According to this decision, this second option does not violate the prohibition of *reformatio in peius* if a limitation according to the first option is not possible. In the present case, the first option would however have been available to the respondent. More particularly, the respondent could equally have restricted the high molecular weight monols in claim 1 of the request held allowable by the opposition division on the basis of the specific high molecular weight monols disclosed in the examples of the application as filed, eg the 1800 molecular weight hetero ethylene oxide/propylene oxide monol of example 1. Thereby, one or more originally disclosed

features would have been introduced into claim 1 of the request held allowable by the opposition division which at the same time would have limited the scope of the patent as maintained.

As the first option thus would have been possible, the second option chosen by the respondent does not escape the prohibition of *reformatio in peius*. In line with G 1/99, the amendment of the high molecular weight monol to a mono-functional active hydrogen oligomer in claim 1 of auxiliary request 3 therefore violates the prohibition of *reformatio in peius*.

- 4.2 Apart from the above objection with regard to *reformatio in peius*, the term "mono-functional active hydrogen oligomer", which has been introduced by way of amendment after grant into claim 1 of auxiliary request 3, gives rise to a deficiency under Article 84 EPC

Claim 1 does not contain any definition of the molecular weight implied by the term "oligomer". Moreover, no evidence was provided by the respondent establishing that the skilled person would know, on the basis of his common general knowledge, what molecular weights are covered by this term.

The respondent in this respect argued that mono-functional active hydrogen oligomers corresponded to high molecular weight mono-functional active hydrogen compounds for which a molecular weight of 600 or more atomic mass units could be derived from the description of the opposed patent. However, firstly, this argument is in clear contradiction to the opposed patent itself,

which refers to **low** molecular weight oligomers (see eg paragraph [0036]). Secondly, as has been set out already above, a claim has to be clear as such in order to meet the requirements of Article 84 EPC. Thirdly, as also set out above, the description of the opposed patent does not define high molecular weight mono-functional active hydrogen compounds to have a molecular weight of 600 or more atomic mass units.

Hence, the respondent's argument is not convincing and in particular cannot alter the finding that the introduction of the feature "mono-functional active hydrogen oligomers" into claim 1 of auxiliary request 3 renders the claim unclear.

4.3 Amended claim 1 of auxiliary request 3 stipulates further that the pressure sensitive adhesive composition is tacky due to being "prepared by including a mono-functional active hydrogen oligomer with the reactants during the synthesis of the prepolymer", a requirement which is allegedly derived from page 8, lines 1-12 as filed. However, contrary to claim 1 of auxiliary request 3, the passage on page 8, in particular page 8, lines 1-3, requires the prepolymer to be an emulsified isocyanate terminated prepolymer. Page 8, lines 1-12 as filed thus does not form a proper basis for this feature in claim 1. No other basis is present in the application as filed for this feature. Therefore this amendment does not meet the requirements of Article 123(2) EPC.

4.4 Finally, claim 1 of auxiliary request 3 covers two alternatives, namely the one discussed above, where the polyurethane dispersion is prepared by including a

mono-functional active hydrogen oligomer, and a second alternative where the polyurethane dispersion is prepared by including a stoichiometric excess of polyol. The two alternatives in claim 1 are linked by the term "and/or". In as far as the "and" is concerned, claim 1 covers embodiments where the pressure sensitive adhesive is tacky due to being prepared by including both a mono-functional active hydrogen oligomer and a stoichiometric excess of polyol.

The application as filed nowhere discloses such embodiments. There are in particular no embodiments disclosed where a combination of monol and polyol is used and where the polyol is present in excess. These embodiments of claim 1 of auxiliary request 3 therefore are not based on the application as filed (Article 123(2) EPC).

- 4.5 For the above reasons, the amendments in claim 1 of auxiliary request 3 violate the prohibition of *reformatio in peius* and do not meet the requirements of Articles 84 and 123(2) EPC. Auxiliary request 3 thus is not allowable.

Auxiliary request 4

5. Auxiliary request 4 contains all features objected to above with regard to auxiliary request 3. Hence, for the same reasons as given for auxiliary request 3, auxiliary request 4 is not allowable.

Auxiliary request 5

6. *Admissibility into the proceedings*

Auxiliary request 5 was filed by the respondent during the oral proceedings before the board as a replacement of previous auxiliary request 5 filed with letter of 14 June 2011. The appellant requested that the new request should not be admitted into the proceedings.

It is at the board's discretion whether to admit the new auxiliary request. According to Article 13(1) RPBA, this discretion shall be exercised in view of *inter alia* the complexity of the new subject matter submitted and the current state of the proceedings.

6.1 In auxiliary request 5, the monol has been restricted to a monol derived from polyalkylene oxide.

According to the respondent, the definition of the monol as monol derived from polyalkylene oxide is derived from page 7, lines 21-23 and page 8, lines 7-14 as filed. The latter passage contains the statement that "[s]uitable mono-functional active hydrogen oligomers include: monols derived from polyoxyalkylene oxides".

This passage requires the monol to be an oligomer. Even if the molecular weight covered by the term "oligomer" is unclear (see point 4.2), this term still implies some limitation of the molecular weight in the application as filed. It is in particular generally accepted that the molecular weight of oligomers is below that of polymers. Contrary to the application as

filed, in claim 1 of auxiliary request 5, this requirement is absent.

Consequently claim 1 of auxiliary request 5 is not clearly allowable under Article 123(2) EPC.

- 6.2 Claim 1 of auxiliary request 5 additionally contains the requirement that pendant groups of the prepolymer can become pendant chains in the dehydrated polyurethane PSA polymer.

The use of the different terms "pendant groups" and "pendant chains" implies that there must be a transformation from a group to a chain (presumably a larger chemical moiety). The claim itself leaves it open what this change could consist of. The same holds true for the description as filed, which on page 8, lines 3-7 simply discloses that a monol (mono-functional active hydrogen oligomer) is "reacted with a poly-functional isocyanate terminated prepolymer to prepare a prepolymer having oligomeric pendant groups which can become pendant chains in the dehydrated polyurethane PSA polymer". Though one learns from this passage that the pendant groups are formed from monols, one still does not know how these groups are transformed to chains in the dehydrated polyurethane polymer. The respondent argued in this context that by way of the dehydration process, a change of the spatial arrangement of the monols would occur. However, due the absence of any evidential support, the respondent's argument is not convincing.

In conclusion, the skilled person is left in the dark as to what change in the pendant groups of the

prepolymer occurs. Therefore, auxiliary request 5 is not clearly allowable with regard to the requirements of Article 84 EPC.

- 6.3 As auxiliary request 5 thus is not clearly allowable and hence increases the complexity of the case in the sense of Article 13(1) RPBA, and as this request was furthermore submitted at the last possible moment during appeal proceedings, namely during the oral proceedings before the board, the request was not admitted into the proceedings by the board.

Auxiliary request 6

7. Claim 1 of auxiliary request 6 contains all the features of claim 1 of auxiliary request 3. Therefore, the same objections as with regard to claim 1 of the latter request apply. Auxiliary request 6 thus is not allowable.

Auxiliary request 7

8. *Reformatio in peius*

Claim 1 of auxiliary request 7 no longer contains the alternative that refers to the use of monols. The appellant still argued that by deleting the monol alternative, claim 1 had been broadened and thereby the prohibition of *reformatio in peius* had been violated.

In fact, however, the deletion of the monol alternative has the effect that polyurethane latex compositions comprising an aqueous polyurethane dispersion prepared from a monol as only active hydrogen compound are no

longer covered by claim 1. Claim 1 of auxiliary request 7 thus is restricted with regard to claim 1 as found allowable by the opposition division. The appellant is therefore not put in a position worse than if it had not appealed. Consequently, the prohibition of *reformatio in peius* is not violated by way of this amendment.

9. *Amendments*

Claim 1 of auxiliary request 7 is identical to claim 1 as granted except that

- (a) the polyurethane aqueous dispersion now is required to be "prepared from a formulation which includes a stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules" and that
- (b) the wording "dispersion that has less than 20 percent pendant chains" has been re-phrased to "which dispersion contains less than 20 percent pendant chains".

9.1 Requirement (a) is disclosed on page 12, lines 2-5 of the application as filed. The rewording under (b) now correctly reflects the disclosure on page 6, lines 19-20 of the application as filed. Therefore, claim 1 of auxiliary request 7 meets the requirements of Article 123(2) EPC. No objections were raised by the appellant in this respect.

The appellant did not raise any objections under Article 123(2) EPC against the further claims and the board is satisfied that these claims are based on the application as filed and thus that the requirements of Article 123(2) EPC are met.

9.2 The appellant did not raise any objections under Article 84 EPC and the board is satisfied that the claims of auxiliary request 7 are clear and thus that the requirements of Article 84 EPC are met.

10. *Sufficiency of disclosure*

10.1 The appellant argued that in order to meet the functional definition in claim 1 of being suitable for being dried to form a pressure sensitive adhesive composition, the amount of pendant chains had to be less than 20 percent. This amount, in the appellant's view, was unclear, which implied that the invention could not be carried out over the entire breadth of claim 1.

10.1.1 The appellant in particular argued that the amount of pendant chains was given in claim 1 relative to the total amount of solids in the dispersion while in paragraph [0033] of the opposed patent it related to the polyurethane pressure sensitive adhesive compound. The skilled person thus would not know how to calculate this amount of pendant chains.

However, this argument is not correct as the only passage in the description of the opposed patent referring to the amount of less than 20 percent pendant chains, namely paragraph [0034], defines this amount

relative to the amount of solids of the dispersion, ie in the same way as does claim 1.

10.1.2 The appellant further argued that the amount of pendant chains was unclear for the additional reason that in case of pendant polyurethane chains, the skilled person could not distinguish between these pendant chains and the polyurethane main chain and thus would not know which chains contribute to the amount of pendant chains.

However, this argument appears not convincing either as the main chain will be the longest chain present in the polyurethane and thus would be distinguishable from pendant chains even in the case where both main and pendant chains are polyurethane chains.

10.2 The appellant further argued that the stoichiometric excess of polyols given in claim 1 was defined in paragraph [0040] of the opposed patent by an isocyanate index of 10-100. This range was very broad and not all polyol amounts covered by this range resulted in pressure sensitive adhesives. According to the appellant, this was proven by D4, which stated in column 2, lines 42-44 that an isocyanate index of less than 80 ("0.8" in D4) did not provide a tacky film. Therefore, in the appellant's view, a research programme would be necessary to identify those isocyanate indexes, and thus those polyol amounts, with which the invention could be successfully carried out and pressure sensitive adhesives could be obtained.

However, contrary to the aqueous systems of the opposed patent, D4 refers to solvent-based systems. These two systems do not necessarily behave in an identical way

with regard to the polyol used in the preparation of the polyurethane polymer. Therefore, any finding in D4 with regard to the effect of polyols in solvent-based systems does not necessarily apply to the aqueous systems of the opposed patent and can in particular not establish any proof that the invention underlying the opposed patent cannot be carried out at certain amounts of polyols.

10.3 The appellant also argued that when using a blend of an excess of polyol together with monols, it would be impossible to obtain polyurethane chains that are terminated by polyol chains as required by claim 1 of auxiliary request 7. However, there is no reason to assume that, when such a blend is applied, polyols would not react with isocyanate groups to result in polyol terminated polyurethane chains. The appellant's argument therefore is not convincing.

10.4 The appellant finally argued that it was not clear to the skilled person whether the invention underlying the opposed patent concerned compositions or pure polymers. as in this context at least ten different terms were used in the opposed patent.

However, even if the terminology used in the opposed patent were to be inconsistent, this is at most an issue of clarity and hence not relevant to sufficiency of disclosure.

10.5 For the above reasons, none of the appellant's arguments can support an attack of insufficiency of disclosure. Sufficiency of disclosure therefore must be acknowledged.

11. *Novelty*

Novelty was attacked by the appellant on the basis of D1 and D5.

11.1 Novelty in view of D1

11.1.1 D1 is directed to the use of aqueous polyurethane dispersions as adhesives, in particular as laminating adhesives (page 2, lines 1-2). The polyurethanes are formed from organic isocyanate compounds, dihydroxy compounds, mono- to three-functional alcohols containing an ionic group or a group that can be transformed to an ionic group, and optionally alcohols and mono-functional polyether alcohols (page 2, lines 45-48).

In example 1 of D1 an aqueous polyurethane dispersion is prepared by reacting 0.2 moles of 2,4-diisocyanatotoluene and 0.05 moles of 2,6-diisocyanatotoluene with 0.1 moles of polypropylene glycol and 0.15 moles of dimethylolpropionic acid until an amount of unreacted NCO-groups of 0.141 wt% is reached, diluting the resulting product with acetone and subsequently adding water, and finally distilling off the acetone to obtain the aqueous polyurethane dispersion.

Polypropylene glycol and dimethylolpropionic acid are diols and thus correspond to the polyols of claim 1 of auxiliary request 7. The amounts of these diols used in example 1 of D1 add up to 0.25 moles which equals the amount of diisocyanates. This implies that no

stoichiometric excess of polyols is applied in example 1 of D1, contrary to what is required by claim 1 of auxiliary request 7.

11.1.2 The appellant argued in this context that the water added in the example of D1 corresponded to a further polyol and that therefore the total amount of polyols in the example was higher than that of the diisocyanates. Therefore, as required by claim 1 of auxiliary request 7, an excess of polyol was applied in the example of D1.

The board cannot accept this argument. The OH-group of water reacts with isocyanate such that carbon dioxide is split off, thereby leaving an amino group that subsequently reacts with a further isocyanate to a urea group (-NH-CO-HN-). By way of this reaction a polyurea results as final product. Contrary thereto, the hydroxyl groups of polyols react with isocyanate to urethane groups (-NHCO-O-), such that in the end a polyurethane rather than a polyurea results. Hence, water reacts with polyisocyanates in a different way than polyols and leads to a different end product, which is why water cannot be considered to be a polyol.

This finding is not altered by the fact that according to paragraph [0032] of the opposed patent, water is considered to contain two or more hydroxyl groups that lead to chain extension of polyurethanes. More particularly, chain extension with water occurs via the above-described polyurea formation and therefore cannot lead to the conclusion that water is a polyol.

11.1.3 The remaining part of D1 does not disclose the application of an excess of polyol either. On the contrary, it is stated on page 3, lines 25-26 that the amount of the hydroxyl groups in the dihydroxy compounds is preferably 0.2-0.8, and more preferably 0.3-0.6, relative to the amount of isocyanate groups in the polyisocyanates, which corresponds to a polyisocyanate rather than a polyol excess.

11.1.4 Consequently, the subject-matter of claim 1 of auxiliary request 7 differs from D1 at least in terms of the polyol amount. As this polyol amount is required by all claims of auxiliary request 7, novelty of the subject-matter of all claims in view of D1 must be acknowledged.

11.2 Novelty in view of D5

11.2.1 D5 is directed to aqueous polyurethane dispersions with limited amount of urea groups (page 2, lines 3-4). Example 1 of D5 discloses an aqueous polyurethane dispersion prepared by reacting 0.440 moles tolylene diisocyanate with 0.200 moles polypropylene glycol and 0.240 moles dimethylolpropionic acid ("DPMA") until an amount of remaining isocyanate groups of 0.10 wt% is reached, diluting with acetone and adding water, and finally distilling off the acetone.

In the same way as in D1, the amount of diols (polypropylene glycol and dimethylolpropionic acid) equals the amount of diisocyanate. Moreover, in the same way as for D1, water cannot be regarded as polyol. This implies that no stoichiometric excess of polyol is applied in example 1 of D5. Such a stoichiometric excess

is furthermore not disclosed in the remaining part of D5.

11.2.2 Consequently, even if, as alleged by the appellant, D5 formed prior art under Article 54(3) and (4) EPC 1973, this document would not be relevant to the novelty of the subject-matter of auxiliary request 7.

12. *Inventive step*

12.1 The opposed patent addresses the technical field of pressure sensitive adhesives ("PSA") (paragraph [0001]). The opposed patent (paragraph [0002]) explains that pressure sensitive adhesives are also described as "tacky adhesives" which are defined to be "slightly adhesive or gummy to the touch" and which can in particular have "limited adhesive strength, such that most materials adhering to a substrate coated with a PSA can be separated from the substrate without tearing or deforming the material or the coated substrate". According to paragraph [0003] of the opposed patent, an example of such pressure sensitive adhesives are the yellow note pads marketed by 3M as "Post-it". The opposed patent in particular aims at improving pressure sensitive adhesives such that they can be washed free of contamination in order to have its tackiness restored (paragraph [0006] and table 1 on page 11) while at the same time avoiding an undesirable increase of tackiness over time (expressed as "peel strength build") (paragraph [0062] and table 2 on page 11).

12.2 The parties started from both D1 and D4 as closest prior art.

12.2.1 However, D1 is directed to laminating adhesives rather than pressure sensitive adhesives and in particular aims at a laminating adhesive with high adhesive strength ("*hohe Verbundfestigkeit*") such that when two substrates are glued together they can only be separated at high temperatures (page 2, lines 31-34). This objective is exactly the opposite of what the opposed patent is aiming at, namely a pressure sensitive adhesive, ie an adhesive that is only slightly adhesive and has a limited increase of peel strength over time. The skilled person looking for improved pressure sensitive adhesives would thus not start from D1.

This finding holds true even if, as alleged by the appellant, the adhesive of D1 is in fact suitable as pressure sensitive adhesive. More particularly, by explicitly referring to high adhesive strength as its objective, D1 would clearly put the skilled person off from testing the adhesive disclosed in this document when looking for improved pressure sensitive adhesives. The skilled person thus would not discover the suitability, if any, of the polyurethane dispersion of D1 as pressure sensitive adhesive.

12.2.2 Contrary to D1, D4 addresses the technical field of pressure sensitive adhesives (column 1, lines 19-21). Therefore, the skilled person looking for improved pressure sensitive adhesives would start from D4 rather than D1. It is thus D4 that forms the closest prior art.

12.2.3 The pressure sensitive adhesive of D4 is formed by the reaction of an organic, aromatic polyisocyanate with diols and/or triols (column 1, lines 50-61). The

polyisocyanate is used in a proportion of between 0.8 to twice the stoichiometric amount of hydroxyl groups of the polyols (column 2, lines 38-42). The general way of preparing the pressure sensitive adhesive is such that the polyol and polyisocyanate are mixed until the isocyanate groups have been reacted, the resulting prepolymer is dissolved in toluene, then spread on a flexible backing material and subsequently dried (column 2, line 66 through column 3, line 6).

Example 1 of D4 describes a process in which 8g tolylene diisocyanate are reacted with 200g of the propylene oxide adduct of 1,2,6-hexane triol having a molecular weight of 6000, the resulting product is dissolved in toluene, and the solution is spread on paper and subsequently dried.

The amount of tolylene diisocyanate applied in D4 corresponds to an amount of isocyanate groups of 0.092 moles. From the amount of the triol adduct, the amount of hydroxyl groups can be calculated to be 0.1 moles. Consequently, as confirmed by table 2 in the appellant's letter of 14 June 2011, the triol adduct is applied in stoichiometric excess as required by claims 1 and 21 of auxiliary request 7.

However, the polyurethane solution in D4 is an organic solvent-based system, contrary to the aqueous dispersion required by claims 1 and 21.

This difference in solvent is also present with regard to the further independent claims 4 and 12 which refer to pressure sensitive adhesive obtainable by drying the aqueous polyurethane dispersion of claim 1. More

particularly, while the pressure sensitive adhesive of these claims is free of organic solvent due to being prepared from an aqueous dispersion, residual organic solvent will be present in the pressure sensitive adhesives of D4, even if the solvent is evaporated in D4 during drying. This is confirmed by page 2, lines 17-19 of D1 where it is stated that residual solvents in laminates derived from solvent-based systems lead to undesirable taste and odour and by D7 where residual solvents in pressure sensitive adhesives derived from solvent-based systems are reported as a disadvantage.

- 12.3 One of the objectives of the opposed patent is the provision of pressure sensitive adhesives that are based on solvent-free systems and that do not exhibit an undesirable peel strength built over time (paragraphs [0028] and [0062], table 2 on page 11 and claim 1). As a solution to this problem, the opposed patent, in the form of the claims of auxiliary request 7, proposes a polyurethane composition that comprises an aqueous polyurethane dispersion and that is prepared from a formulation which includes a stoichiometric excess of polyols such that the polymer terminates in unreacted polyol chains which are not connected to other polymer molecules.

The polyurethane compositions and pressure sensitive adhesives of the examples of the opposed patent are not according to the claims of auxiliary request 7 as they are not prepared with a polyol excess. As acknowledged by the respondent, the examples of the opposed patent therefore cannot prove that the problem addressed by

the opposed patent is solved by the subject-matter of the claims of auxiliary request 7.

12.3.1 Nevertheless, the board considers it credible that this problem is in fact solved on the basis of the explanations given by the respondent during oral proceedings before the board:

Aqueous polyurethane dispersions comprise an aqueous phase in which polyurethane particles are located. If, as is required by the claims of auxiliary request 7, the polyurethane is prepared with an excess of polyol, the polyurethane terminates in unreacted polyol chains which are not connected to other polymer molecules. The polar hydroxyl group at the chain ends are located at the surface of the polyurethane particles such that they extend into the polar aqueous phase. The polyurethane resulting after drying of the dispersion thus will have unreacted terminal hydroxyl groups on its surface. These hydroxyl groups are able to form hydrogen bonds to a substrate and thereby provide for the slight adhesiveness needed for pressure sensitive adhesives. Hence, it is credible that the aqueous polyurethane dispersions according to the claims of auxiliary request 7 are suitable for being dried to form pressure sensitive adhesive compositions.

Moreover, if the polyurethane is prepared with an excess of polyol as required by the claims of auxiliary request 7, no unreacted isocyanate groups remain in the polyurethane. Thereby no

further reaction of any such isocyanate groups with any remaining water in the final pressure sensitive adhesive can occur and any increase of adhesive strength over time due to such a reaction is avoided. Therefore, the resulting pressure sensitive adhesive has a reduced peel strength build.

12.3.2 The problem of providing pressure sensitive adhesives based on solvent-free systems and exhibiting reduced peel strength build thus is credibly solved by the subject-matter of the claims of auxiliary request 7.

12.4 It remains to be decided whether the solution offered by the claims of auxiliary request 7 is obvious from the cited prior art.

12.4.1 D4 itself refers to solvent-based systems and does not contain any indication of replacing the organic solvent by an aqueous phase. Moreover, as was not disputed by the appellant during the oral proceedings before the board, the chemistry in solvent-based systems is different from that in aqueous systems. It can therefore not be assumed and in fact was not even alleged by the appellant that the solvent-based polyurethane systems of D4 can be transformed to aqueous systems by simply replacing the organic solvent with water. The skilled person aiming at solvent-free systems would therefore not have arrived at aqueous systems on the basis of D4 alone.

12.4.2 According to the appellant, the skilled person would however turn to D1. This document reports on page 2, lines 14-19 several disadvantages of adhesives based on

solvent-containing systems and proposes as a solution polyurethane adhesives that are based on aqueous systems. In the appellant's view, the claimed subject-matter therefore lacked inventive step in view of D4 in combination with D1.

However, the skilled person starting from D4 and looking for solvent-free pressure sensitive adhesives first of all would not have turned to D1 as this document aims at laminating adhesives with high adhesive strength (page 2, line 32) and thereby clearly teaches away from pressure sensitive adhesives (see point 12.2.1 above).

Moreover, neither D4 nor D1 give any motivation to use polyurethanes prepared with a polyol excess in order to reduce the peel strength build. In fact, while D4 discloses both, polyurethanes prepared from a polyol excess and polyurethanes prepared with an isocyanate excess (eg examples 2 and 3 of D4 use an isocyanate excess, see table 2 of the appellant's letter of 14 June 2011), D1 gives even a clear preference for an isocyanate excess (page 3, lines 25-26). Therefore, there is no reason to believe that a skilled person confronted with the problem of providing solvent-free pressure sensitive adhesives with reduced peel strength build would use polyurethanes prepared with a polyol excess in view of the teaching of D4 and D1.

12.4.3 The subject-matter of the claims of auxiliary request 7 therefore is inventive in view of D4, both taken alone as well as in combination with D1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent on the basis of claims 1 to 21 according to auxiliary request 7 filed during the oral proceedings after any necessary consequential adaptation of the description.

The Registrar:

The Chairman:

G. Röhn

W. Sieber