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**Datasheet for the decision  
of 18 February 2009**

**Case Number:** T 0284/06 - 3.3.03

**Application Number:** 96305838.3

**Publication Number:** 0759450

**IPC:** C08G 18/48

**Language of the proceedings:** EN

**Title of invention:**

Viscosity-stable isocyanate-terminated prepolymers and polyoxyalkylene polyether polyols having improved storage stability

**Patent Proprietor:**

BAYER ANTWERPEN N.V.

**Opponent:**

ASAHI GLASS COMPANY, LTD.  
Shell International B.V.  
THE DOW CHEMICAL COMPANY  
BASF Aktiengesellschaft

**Headword:**

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**Relevant legal provisions:**

EPC Art. 54, 56, 100(b)

**Keyword:**

"Novelty (yes)"  
"Inventive step - problem and solution (yes)"  
"Opposition grounds - insufficiency of disclosure (no)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0284/06 - 3.3.03

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.03  
of 18 February 2009

**Appellant:** BAYER ANTWERPEN N.V.  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office dated 16 December 2005  
and posted 17 February 2006 revoking European  
patent No. 0759450 pursuant to Article 102(1)  
EPC 1973.

**Composition of the Board:**

**Chairman:** W. Sieber  
**Members:** A. Däweritz  
C.-P. Brandt

## Summary of Facts and Submissions

I. The grant of European patent No. 0 759 450 in respect of European patent application No. 96 305 838.3, filed on 8 August 1996 and claiming the priority of 10 August 1995 of an earlier application filed in the U.S.A. (513264), was announced on 23 October 2002 (Bulletin 2002/43). The patent was granted with twenty-one claims, including the following independent claims:

1. An isocyanate-terminated, viscosity stable prepolymer composition prepared by reacting an excess of an organic di- or polyisocyanate with a polyol component comprising one or more polyoxyalkylene polyether polyols having a nominal functionality of two or more, at least one of said one or more polyoxyalkylene polyether polyols prepared by the oxyalkylation of a suitably functional initiator molecule in the presence of a double metal cyanide complex catalyst and containing double metal cyanide complex catalyst or double metal cyanide complex catalyst residues;  
wherein said polyol component further comprises from 10 to 3000 ppm based on the weight of said polyol component of one or more antioxidants; and  
wherein said prepolymer composition contains from 10 to 1000 ppm double metal cyanide complex catalyst or double metal cyanide complex catalyst residues.
9. A storage stable polyoxyalkylene polyol composition having a nominal calculated functionality of between 1.5 and 8, prepared by oxyalkylating one or more polyhydric initiators with one or more alkylene oxides in the presence of one or more double metal cyanide complex catalysts, said polyoxyalkylene component containing from 10 to 1000 ppm of double metal cyanide complex catalysts and/or double metal cyanide complex catalyst residues, and a stabilizing amount of one or more antioxidants.
12. A storage stable polyoxyalkylene polyol composition comprising from greater than 25 ppm to 1000 ppm of one or more double metal cyanide complexes or a residue thereof, based on the weight of said polyol, said polyol composition exhibiting a storage stability greater than an otherwise similar polyol containing substantially none of said double metal cyanide complex or residue thereof and a stabilising amount of one or more antioxidants.
15. A method for increasing the storage stability of a double metal cyanide complex catalyzed polyoxyalkylene polyol, comprising:
  - a) adjusting the amount of double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues to between 10 ppm and 250 ppm based on the weight of said polyol;
  - b) adding an stabilizing amount of one or more antioxidants to said polyol.
19. A polyurethane polymer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable as the reaction product of a di- or polyisocyanate at an isocyanate index of from 70 to 130 with a polyol component of polyol as claimed in any one of claims 9 to 14.
20. A polyurethane polymer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable by reacting an isocyanate reactive component with the isocyanate-terminated prepolymer of any one of claims 1 to 8 at an index of from 90 to 110.
21. A moisture-cured one component polyurethane elastomer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable by curing an isocyanate-terminated prepolymer as claimed in any one of claims 1 to 8 containing from 1 to 3 weight percent free NCO groups in the presence of atmospheric moisture.

The remaining claims were all dependent and were appendant to preceding claims of the respective same category, including:

10. A polyoxyalkylene polyol composition as claimed in 9 **characterised in that** said antioxidant is a non-amino group-containing antioxidant.

In this decision, any reference to passages in the patent in suit as granted will be given underlined in

squared brackets, eg [Claim 1]. References in underlined italics concern passages in the application as originally filed, eg Claim 1. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973". "DMC" refers both to double metal cyanide complex catalyst and double metal complex catalyst residue and "BHT" to butylated hydroxytoluene (di-tert.-butyl-p-cresol).

II. The above [Claims 9 and 15] were derived from Claims 10 and 16, respectively, reading as follows:

**10.** A storage stable polyoxyalkylene polyol component having a nominal calculated functionality of between 1.5 and 8, prepared by oxyalkylating one or more polyhydric initiators with one or more alkylene oxides in the presence of one or more double metal cyanide complex catalysts, said polyoxyalkylene component containing from 10 to about 1000 ppm, of double metal cyanide complex catalysts and/or double metal cyanide complex catalyst residues, and a stabilizing effective amount of one or more antioxidants;

wherein said polyol component exhibits greater storage stability than an otherwise similar polyol component containing substantially no double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues.

**16.** A method for increasing the storage stability of a double metal cyanide complex catalyzed polyoxyalkylene polyol, comprising:

- a) adjusting the amount of double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues to between 10 ppm and 250 ppm based on the weight of said polyol;
- b) adding an effective stabilizing amount of one or more antioxidants to said polyol, wherein the storage stability of said polyol containing both said double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues and said antioxidant is greater than an otherwise similar polyol not containing double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues.

III. On 10, 18, 22 and 22 July 2003, respectively, four Notices of Opposition by Opponents O-01 to O-04 were filed, in each of which revocation of the patent in its entirety was requested on the basis of objections of lack of novelty, lack of inventive step and insufficiency of disclosure (Articles 100(a), 100(b), 52(1), 54, 56 and 83 EPC 1973). O-01, O-03 and O-04 additionally raised the objection that the subject-matter of the patent in suit extended beyond the content of the application (Articles 100(c) and 123(2) EPC 1973).

Apart from the opposition of O-03, these oppositions were withdrawn in letters dated 7 July 2004 (O-04), 14 April 2005 (O-01) and 12 May 2005 (O-02), respectively.

The Patent Proprietor, on the other hand, requested that the patent be maintained as granted or, in the alternative, on the basis of one of two auxiliary requests filed at the oral proceedings held before the Opposition Division on 16 December 2005.

The claims of the First Auxiliary Request differed from those as granted only in that the last three lines of Claim 10 had been reintroduced at the end of [Claim 9].

The claims of the Second Auxiliary Request differed from the claims as granted in that (i) [Claim 10] had been deleted, (ii) [Claims 11 to 21] had been renumbered as Claims 10 to 20 and adapted accordingly and (iii) the antioxidants in each of Claims 1, 9, 11 and 14 of this request, as renumbered, had been limited to "non amino-group-containing antioxidants".

Altogether twenty-four documents had been cited by the Opponents. Each of O-01 to O-03 further supplemented its case by an experimental report in order to demonstrate that the asserted stabilising effect would not be achieved. The cited documents included

- D1: US-A-4 472 560,
- D2: US-A-4 477 589,
- D3: WO-A-93/19110,
- D7: Polyurethane Handbook, G. Oertel Ed., Hanser Publishers, Munich Vienna New York, 1985, pages 49, 50 and 511,
- D13: US-A-3 941 849,
- D15: 34<sup>th</sup> Annual Polyurethane Technical/Marketing Conference 1992, pages 128 to 134,
- D16: US-A-4 985 491,
- D18: US-A-3 829 505,

- D21: US-A-5 248 833,  
D22: US-A-4 355 188,  
D23: Polyurethane Kunststoff Handbuch 7, G. Oertel Ed.,  
3<sup>rd</sup> Edition, Hanser München, Wien, 1993, pages 15  
to 17, 65, 96 to 97, 120 to 122, 211 to 220 and  
452 to 454, and  
D24: Polyurethane Handbook, G. Oertel Ed., 2<sup>nd</sup> Edition,  
Hanser Publishers, Munich Vienna New York, 1993,  
pages 14 to 17, 61 to 63, 92, 93, 113, 114, 194 to  
202, 418 to 421 and 555 to 557.

IV. In the decision, announced at the end of the above oral proceedings and issued in writing on 17 February 2006, the patent was revoked.

(1) More particularly, [Claim 9] (of the Main Request) was held therein to contravene Article 123(2) EPC 1973 because of the deletion of the last three lines from Claim 10 (cf. sections I and II, above), which resulted in [Claim 9] including subject-matter extending beyond the application as originally filed. Therefore, the Main Request was refused.

(2) With regard to the two Auxiliary Requests, the decision under appeal held them to be admissible, since no objections under Article 84, 123(2) or 123(3) EPC 1973 had been raised by the Opponents in this respect.

(3) Furthermore, the objection under Article 100(b) EPC 1973 (insufficient disclosure) raised by O-03 against both Auxiliary Requests based on the assertion of lack of clarity of the expressions "*viscosity stable*" and "*storage stable*" in Claims 1, 9 and 12 of the First, and in Claims 1, 9 and 11 of the Second Auxiliary Request, respectively, was rejected, because lack of clarity was not a ground for opposition. Moreover, in

view of the [Examples], [Figures 1 to 4] and the experimental data provided by the other former Opponents, the Opposition Division did not find O-03's arguments convincing that (i) "*the storage stability test required comparison with a material exhibiting no DMC catalyst which was difficult to achieve*", (ii) "*types of DMC catalysts exist having a very small particle size which could not be filtered down to a level of 25 ppm*", so that (iii) "*such test could not be carried out for all particle sizes of DMC catalysts*" and, therefore, the basis for proper comparison would have been uncertain. Nor was the Opposition Division convinced that O-03's Analytical Report (Annex II, dated 17 July 2003) would have shown that the storage stability could not reproducibly be increased by the measures of the patent in suit. Since the burden of proof for the allegation, that the patent in suit would not indicate sufficiently how the viscosity stability and storage stability tests in the above mentioned claims were to be performed, had been on O-03, and in view of the different experimental results mentioned above, the Opposition Division, rather, gave the benefit of doubt to the Patent Proprietor, because it saw no reason to assume that the subject-matter of the patent in suit could not be carried out by a skilled person (decision: page 4).

(4) Nor was the novelty objection of O-03, which had been based on D13, D1 and D2, respectively, deemed to be well-founded. The Opposition Division concluded from its detailed analysis of the disclosure of these documents (pages 5 to 7, 10 and 11 of the decision) that the subject-matter of each of the independent Claims 1, 9, 12, 15 and 19 to 21 of the First and of each of the independent Claims 1, 9, 11, 14, 18, 19 and

20 of the Second Auxiliary Request was novel vis-à-vis each of these cited documents.

(5) The Opposition Division considered D13 to be the closest piece of prior art for the polyol compositions of Claims 9 and 12 of the First Auxiliary Request. More particularly, it identified the presence of an anti-oxidant in the compositions of Claims 9 and 12 as being the only difference to the triol (2) used in Example 9, Run 62 (Table K) of D13, which contained 240 ppm of DMC catalyst (both values being inside the ranges in Claims 9 and 12; decision: page 8, No. 2.1). The stability test in both of the above claims was not considered to be a distinguishing feature, but a functional feature showing the consequences of the various concentrations of the DMC catalyst in the polyol in the presence of an antioxidant, as demonstrated in [Figures 1 to 4].

(6) The Division derived from D13 that triol (2) disclosed in Table K of the document must have a greater storage stability than an otherwise similar polyol containing substantially no DMC catalyst, because it comprised already the claimed concentrations of DMC catalyst, at least in the presence of a stabilising amount of one or more antioxidants.

(7) The problem to be solved was seen in the provision of *"a storage stable polyoxyalkylene polyether polyol composition having a greater storage stability than otherwise similar polyol containing substantially none of said DMC catalyst, in the presence of a stabilising amount of one or more antioxidants"* or, in other words, the polyol compositions *"comprising already a stabilizing amount of DMC catalyst"* should further be



stabilised against degradation upon storage (decision: page 8, item 2.1, paragraphs 3 and 5).

(8) In view of the quotation from D13 in the paragraph bridging pages 8 and 9 of the decision ("*Antioxidants or antidegradants such as phenyl beta naphthylamine, PBNA, or other antidegradants are desirably added prior to or after polymerization **to avoid degradation which might occur**. PBNA may be used in an amount by weight approximately equal to the amount of the catalyst during telomerization. Some antidegradants may retard polymerization and should be added after telomerization.*"; D13, column 6, line 64 et seq.; emphasis added by the Opposition Division), the solution to the above problem was deemed obvious from D13 itself or from D13 in combination with general knowledge of the person skilled in the art as demonstrated by D7, D15, D23 and D24, which would suggest to add an antioxidant in order to avoid degradation of the polyol and to achieve greater storage stability.

The Opposition Division came to the same conclusion concerning inventive step when starting from two further triols mentioned in Example 9 of D13 (Table K: triols (3) and (4)).

(9) Despite the fact that the antioxidants were limited in the Second Auxiliary Request to non-amino group containing antioxidants, the Opposition Division took the view that it had been obvious to add an antioxidant such as BHT to a triol of D13, Example 9, as mentioned above, because D24 disclosed BHT as a hindered phenol antioxidant usually employed for polyether polyols.

(10) Consequently, the Opposition Division decided that the grounds for opposition prejudiced the maintenance of the patent in suit and, therefore, revoked it.

V. On 28 February 2006, a Notice of Appeal was filed against this decision by the Patent Proprietor/Appellant. The prescribed fee was paid on the same day.

(1) In the Statement of Grounds of Appeal (SGA), received on 26 June 2006, the Appellant refiled the set of claims of the above Second Auxiliary Request (section III, above) as the new Main Request, disputed the reasons for the refusal of the above Second Auxiliary Request, which had resulted in the patent in suit being revoked, referred to D21, D22 and five additional documents

D25: J.L. Schuchardt, S.D. Harper, "Preparation of High Molecular Weight Polyols Using Double Metal Cyanide Catalysts", 32<sup>nd</sup> Annual Polyurethane Technical/Marketing Conference, October 1-4, 1989, pages 360 to 364,

D26: EP-A-0 383 333,

D27: EP-A-0 385 619,

D28: US-A-5 099 075 and

D29: US-A-5 235 114

to support its arguments and requested that the patent in suit be maintained on the basis of the above Main Request.

(2) The Appellant asserted D22 to be the closest state of the art rather than D13, referred to Example 1 of D22, in which DMC catalyst residue and an oxidant were present in the polyol product, and saw the technical problem to be solved with regard to D22 in the

provision of polyols with improved storage stability and of viscosity-stable, isocyanate-/(NCO)-terminated prepolymers (as addressed in [0001]).

(3) The Appellant further contended that the solution offered by the patent in suit was not obvious from the prior art, because it had been common practice in the art of DMC-catalysed polyol production at the priority date of the patent in suit to remove the catalyst residues from the produced polyol, as confirmed by the documents referred to in section V(1), above.

VI. In its rejoinder dated 9 November 2006, the Respondent/O-03 maintained its objections of lack of sufficient disclosure, lack of novelty vis-à-vis D13 and lack of inventive step. In particular, it asserted that the technical problem underlying the patent in suit could only be seen in the provision of alternative NCO-terminated prepolymers and of alternative DMC polyol materials, irrespective of whether D13 (its choice) or D22 (the Appellant's choice) was taken as the closest prior art. Additionally, it referred to D1 (or D2), allegedly showing DMC catalysed polyol to be suitable for the production of flexible polyurethanes "*whether or not containing catalyst residues*". Like D24, D1 would also indicate a preference for the use of antioxidants. Furthermore, the Respondent argued that the patent in suit did not provide any data "*to support the hypothesis of improved viscosity stability, in relation to the invention of Claim 1.*"

Concerning the objection under Article 100(b) EPC (cf. section IV(3), above), the Respondent provided its arguments at great length (pages 2 to 6 of the letter), thereby taking the position that various techniques

could be used to remove the DMC catalyst, for example heating of the DMC/polyol mixture. This would, however, cause the polyol to denature in a way which would produce exactly the kind of volatiles which the "test" as set out in Claim 9 was intended to detect, thus, rendering the results of the test invalid. Moreover, the removal of the DMC catalyst by the other methods disclosed in [0006] and [0007] would produce different results, both in terms of effectiveness of catalyst removal and polyol degradation. These arguments were summarised at the bottom of page 5 and on page 6 as follows: *"Accordingly, the specification does not contain sufficient description for the invention to be put into practice by one of skill in the art, both because the test in claims 9 and 11 cannot be carried out for a significant proportion of materials covered by the claims, and because the requirement for the production of a 'storage stable' material cannot be a met. ... The specification also does not contain sufficient information to enable one of skill in the art to determine whether any given material is 'viscosity stable' within the meaning of Claim 1, since the only Example in which viscosity is measured (Example 6) does not make use of an antioxidant. At the very least, the terms 'storage stable', 'viscosity stable', and the purported comparison tests of claims 9 and 11 are so unclear and indefinite that they cannot serve as features capable of distinguishing the invention from the prior art."*

VII. In a further letter dated 12 July 2007, the Respondent withdrew its opposition without further comments.

VIII. On 5 December 2008, the Board summoned the Appellant to oral proceedings. In an annex to the summons, the

Appellant was informed that all objections raised by the former Opponents might play a role at the hearing.

IX. In a letter dated 16 January 2009, the Appellant submitted, in preparation for the oral proceedings, five Auxiliary Requests and presented its views to the issues of Articles 123(2), 123(3), 84, 83, 54 and 56 EPC. With regard to inventive step, the Appellant argued that D13 related to the provision of polyether polyols having low contents of unsaturated end groups, but that it did not provide any information concerning the storage stability of the products obtained. Many years later, attention was paid to the latter property in D22 and the solution described therein consisted in the removal of the catalyst remains, because it had been found that these remains had deteriorating effects on the polyurethanes prepared from the polyols. Moreover, Example 1 of D22 described a polyol containing DMC catalyst remains and an amino group-containing antioxidant, which showed significantly lower storage stability than the same polymer from which the catalyst remains had been removed. D22 did not suggest anywhere that the kind of antioxidant might have an effect on the storage stability of the polyol prepared by means of DMC catalyst (page 6 of the letter).

X. In a further letter dated 9 February 2009, the Appellant submitted six diagrams containing a graphic presentation of measurements provided by the former opponents in their respective experimental reports (mentioned in section III, above) and supplemented by further data obtained by the Appellant in a series of experiments of its own. These results confirmed, according to the Appellant, that a stabilising effect

could be found, which was increased with increasing amounts of DMC catalyst used in combination with a phenolic antioxidant.

XI. The oral proceedings were held on 18 February 2009.

(1) During these oral proceedings, the Appellant then withdrew the Main Request (section V(1), above) and the above Auxiliary requests 1 and 3 to 5, made the remaining Second Auxiliary Request its new Main Request and filed a new copy of this sole remaining request.

(2) Therefore, this decision can focus on those aspects of the Appellant's arguments, which concerned the sole remaining request (Claims 1 to 18), containing the following independent claims:

"1. *An isocyanate-terminated, viscosity stable prepolymer composition prepared by reacting an excess of an organic di- or polyisocyanate with a polyol component comprising one or more polyoxyalkylene polyether polyols having a nominal functionality of two or more, at least one of said one or more polyoxyalkylene polyether polyols prepared by the oxyalkylation of a suitably functional initiator molecule in the presence of a double metal cyanide complex catalyst and containing double metal cyanide complex catalyst or double metal cyanide complex catalyst residues;*

*wherein said polyol component further comprises from 10 to 3000 ppm based on the weight of said polyol component of one or more antioxidants characterised in that at least one of said one or more antioxidants comprises a hindered phenol antioxidant; and*

*wherein said prepolymer composition contains*

*from 10 to 1000 ppm double metal cyanide complex catalyst or double metal cyanide complex catalyst residues.*

8. *A storage stable polyoxyalkylene polyol composition having a nominal calculated functionality of between 1.5 and 8, prepared by oxyalkylating one or more polyhydric initiators with one or more alkylene oxides in the presence of one or more double metal cyanide complex catalysts, said polyoxyalkylene component containing from 10 to 1000 ppm of double metal cyanide complex catalysts and/or double metal cyanide complex catalyst residues, and a stabilizing effective amount of one or more antioxidants which comprise a hindered phenol antioxidant;  
wherein said polyol composition exhibits greater storage stability than an otherwise similar polyol composition containing substantially no double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues.*
  
12. *A method for increasing the storage stability of a double metal cyanide complex catalyzed polyoxyalkylene polyol, comprising:  
a) adjusting the amount of double metal cyanide complex catalyst and/or double metal cyanide complex catalyst residues to between 10 ppm and 250 ppm based on the weight of said polyol;  
b) adding a stabilizing amount of one or more antioxidants to said polyol characterised in that said antioxidant comprises a hindered phenol antioxidant.*

16. *A polyurethane polymer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable as the reaction product of a di-or polyisocyanate at an isocyanate index of from 70 to 130 with a polyol composition as claimed in anyone of claims 8 to 11.*
17. *A polyurethane polymer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable by reacting an isocyanate reactive component with the isocyanate-terminated prepolymer composition of anyone of claims 1 to 7 at an index of from 90 to 110.*
18. *A moisture-cured one component polyurethane elastomer composition comprising a double metal cyanide catalyst or double metal cyanide catalyst residue and antioxidants, obtainable by curing an isocyanate-terminated prepolymer composition as claimed in anyone of claims 1 to 7 containing from 1 to 3 weight percent free NCO groups in the presence of atmospheric moisture."*

(3) The Appellant contended that the new set of claims met the requirements of Articles 123(2), 123(3) and 84 EPC. Thus, Claim 1 corresponded to a combination of Claims 1, 5 and 6 and Claims 2 to 7 to Claims 2 to 4 and 7 to 9, respectively. Claim 8 was a combination of Claim 10 with the first alternative of Claim 12, whilst the second alternative of Claim 12 formed the subject-matter of Claim 9. Similarly, new method Claim 12 was said to relate to the combination of Claim 16 and the first alternative of Claim 19, whilst the second



alternative of Claim 19 formed the subject-matter of new Claim 15. Claims 10, 11, 13, 14 and 16 to 18 were identified as corresponding to Claims 14, 15, 17, 18 and 20 to 22, respectively.

(4) As regards the deletion of the passage "wherein the storage stability ... catalyst residues", as contained in Claim 16 (section II, above), from the wording of operative Claim 12 (which has never been an issue for debate between the former parties at any stage of the opposition or appeal proceedings), the Appellant explained at the hearing, that the reinstatement of this passage in the claim would only create a tautology.

(5) The objection of the former Respondent alleging that the person skilled in the art would not be able to reliably determine the storage or viscosity stability (section VI, above) was disputed by the Appellant who referred to the experimental reports of the former Opponents (see section III, above). They had apparently been able to carry out comparisons as foreseen in Claim 10 and in Claim 8 of the new request (cf. sections II and XI(2), above), respectively, apparently without problem. Moreover, the Appellant referred also to commercial DMC-catalysed products freed from residual catalyst (irrespective of whether chemically affected by this removal or not) as used in O-03's experimental report and also in D22. Thus, in Example 1, Table I of D22, three polyols had been compared with one another: (i) a commercial polyol "CP-3000" believed to be stabilised with a phenolic antioxidant, (ii) an amine stabilised polyol not freed from residual DMC and (iii) an amine stabilised polyol from which the DMC catalyst had been removed. Nevertheless, the authors of D22 had not had any difficulty in comparing the storage

stabilities of these polyols, irrespective of whether they had been different from each other or differently treated. Furthermore, the Appellant referred to the description in [0019] to [0022], according to which the catalysts could be contained in the polyol in different forms, which could be removed by appropriate methods, even methods not causing the degradation of the polyol. Well-known methods for the removal of DMC catalysts would include eg filtration, adsorption, chelate formation, ion exchange treatment and/or denaturing, which could be applied by the person skilled in the art in accordance with his/her expertise, and the patent in suit gave additional guidance.

In essence, the decisive point would be whether or not a polyol composition as claimed, which contained DMC-catalyst and antioxidant, was more storage stable than a product according to the state of the art. In fact, if this had been a questionable issue, this could at most be seen as a question of clarity, ie one of Article 84 EPC, not being a ground for opposition.

(6) With regard to the novelty objection, the Appellant pointed out that the arguments presented by the former Respondent completely ignored the fact that amino-group containing antioxidants, as mentioned in D13, had already been excluded from the previous Main Request and still were (sections V(1), III and XI(2), above).

(7) As regards the assessment of inventive step, the Appellant confirmed its view that D22 was the closest piece of prior art, because D22 aimed at the provision of more stable polyols and prepolymers prepared therefrom, ie the same problem as in the patent in suit, whilst D13, one of the early documents relating to DMC

catalysis, dealt only with the problem of providing polyols having less unsaturated end groups. The reader would, however, derive from D22, starting at column 1, line 50, that DMC catalyst remains were detrimental to the storage stability of the polyol and the viscosity of prepolymers prepared therefrom. This was confirmed by the results in Example 1, Table I of D22 (mentioned in section XI(5), above), wherein polyol (ii) (amine stabilised, not freed from DMC catalyst remains) had shown the poorest storage stability after a 5 h-storage at 100°C. In accordance with this result, the experts unanimously removed any DMC catalyst remains after the preparation of the polyols from their respective products, as confirmed by the additional documents cited in the SGA (section V(1), above).

By contrast, the advantageous effect or synergism of the presence of a combination of DMC catalyst and of a hindered phenol antioxidant as required by the Main Request was even demonstrated by the comparative data submitted by the former Opponents as could be seen from the six diagrams submitted with the letter dated 9 February 2009 (section X, above). This advantageous effect could not, in the Appellant's view, be derived in an obvious way from any one of the documents cited by the previous Opponents whether alone or in combination with one another.

- XII. In its final request, the Appellant requested that the decision under appeal be set aside and the patent in suit be maintained on the basis of Claims 1 to 18 according to the Main Request filed at the oral proceedings.

## Reasons for the Decision

1. The appeal is admissible.
2. In view of the explanations given by the Appellant (sections XI(3) and XI(4), above), the Board has no objections against the claims under Article 123(2) EPC. The combination of the features of Claims 1, 5 and 6 in the new Claim 1 is not objectionable. This finding is also valid for the combinations of the features of Claims 10, 12 and 6 in new Claims 8 and 9 and of those of Claims 16, 19 and 6 in new Claims 12 and 15, respectively. Nor do the claims violate Article 123(3) EPC, because they are further limited by these amendments.
3. Nor has the Board any reason to raise an objection under Article 84 EPC with respect to the amendments.
4. As regards the objection under Article 100(b) EPC, as raised by the former Respondent, the Board sees no reason, in particular in the light of the explanations and arguments of the Appellant (sections XI(5), above), to deviate from the decision made in this respect by the Opposition Division (section IV(3), above).
5. As pointed out by the Appellant (section XI(6), above), the arguments provided by the former Respondent in its rejoinder (section VI, above) refer only to D13 as allegedly anticipating prior art. However, D13 neither refers to polyol nor prepolymer compositions stabilised by means of hindered phenol antioxidants. The only passage of the document mentioning antioxidants refers to phenyl beta naphthylamine (PBNA), ie a compound completely different from hindered phenol antioxidants.

Therefore, the Board has come to the conclusion that the claimed subject-matter of independent Claims 1, 8 and 12, each being limited to the presence of a hindered phenol antioxidant, is novel. This is also true for the other claims, each of which contains a direct or indirect reference to one of the above independent claims.

6. *Problem and solution*

6.1 The patent in suit pertains to viscosity-stable isocyanate-terminated prepolymers and to polyoxy-alkylene polyols prepared by means of DMC catalysts and having improved storage stability which may be used to make such prepolymers (cf. [0001]).

6.2 Whilst the former Respondent in its rejoinder maintained that D13 would be the closest piece of prior art not only for novelty but also for the assessment of inventive step, the Board accepts the argument of the Appellant that D22 is the closest piece of prior art for the assessment of inventive step. It is noteworthy that D13, according to the Appellant one of the early documents relating to DMC catalysis (section XI(7), above) is a division of D18 (mentioned and considered on [page 2, lines 41 to 43] and in D22, column 1, line 27). Neither D13 nor D18 considers the behaviour of the polyether polyols upon storage or the effects of such storage on the polyols prior to their use in the preparation of polyurethane prepolymers.

6.3 By contrast, D22 ([0006]) addresses the problems of such storage of the DMC catalysed polyether polyols (D22, column 1, line 51 to column 2, line 9 and in column 8, lines 31 to 41) and deals with the prevention of disadvantages caused by DMC catalyst remains in the

polyol by removing these remains therefrom (D22, Claim 1 and column 2, line 64 to column 3, line 1).

As conceded by the Appellant (section XI(5) and XI(7), above), the document also considers the addition of an antioxidant in its Example 1. This example contains a comparison of a commercial polyol, believed to be stabilised with a phenolic antioxidant (Footnote 2 to Table I), with two amine stabilised polyols, one not freed from its DMC catalyst residues, the other treated according to the method of D22 to remove these catalyst residues. The results given in Table I clearly indicate that the polyol containing DMC catalyst residues and an (amino-group containing) antioxidant had shown the poorest storage stability of the polyols used in the example (cf. section IX, above).

- 6.4 The technical problem to be solved with respect to D22 can therefore be seen in the provision of polyoxy-alkylene polyols with improved storage and isocyanate-terminated prepolymers derived therefrom having an improved viscosity stability.
- 6.5 As demonstrated in [Example 5] and as shown by the Appellant in its latest letters and at the oral proceedings (sections X and XI(7), above), even the experimental data submitted by the former Opponents demonstrate improvements in the storage stability of the polyols, which has also an effect on the viscosity of prepolymers prepared therefrom.
- 6.6 Consequently, the Board has no reason not to accept the Appellant's arguments that the above technical problem was in fact solved by the features of the independent claims.

7. *Inventive step*

It remains to be decided whether the claimed solution of the above problem (sections 6.4, above) derives in an obvious way from the cited documents.

7.1 From the considerations in section 6.3, above, it is evident that D22 by itself does not teach to solve the above technical problem in an obvious manner and thereby to arrive at the claimed subject-matter. Rather, it clearly leads the person skilled in the art to the removal of any DMC catalyst or its residues from the polyol before its storage, as already indicated in [0006] and as argued in the SGA (section V(3), above).

7.2 As shown in section 6.2, above, D13 cannot contribute to the solution of the above technical problem either. Like its parent D18, which is discussed in detail in column 1, lines 27 to 50 of D22 and which had been found to show the disadvantages addressed in the subsequent lines 51 to 62 in column 1 of D22, D13 can only be considered to belong to the state of the art dealt with in D22. It does not at all provide any guidance as to how to improve the storage stability of polyols obtained by means of DMC catalyst in comparison with the results described in D22, let alone to improve the storage stability in a way clearly contrary to the teaching of D22.

7.3 Nor does the disclosure of D24 go beyond the disclosure or teaching of D22. It must be noted that according to pages 61 and 62 of this Handbook, which had been cited in the decision under appeal and mentioned again on page 7 of the rejoinder, the same sequence of process features as in D22 was followed, ie it refers to the removal of catalyst before any addition of antioxidants.

This follows from the last paragraph above and the two paragraphs below Fig. 3.1 in D24 and from the figure itself. Hence, this disclosure corresponds at most to the first test in Table I of D22 (use of the commercial polyol) and cannot contribute to the finding of the solution to the above problem as disclosed and claimed in the patent in suit.

- 7.4 None of Documents D1, D2, D3 and D16, referred to shortly by the former Respondent (page 9 of the rejoinder), considers the storage of DMC catalysed polyol products at all. The first two documents mention only the possibility of storing the DMC catalysts (D1, column 4, line 63 to column 5, line 6 and column 10, lines 56 to 60; D2, column 1, lines 59 to 63, column 4, line 62 to column 5, line 4 and column 14, lines 9/10). The latter two documents are completely silent about any storage of substances and any effect associated therewith. Therefore, they are completely irrelevant for the technical problem dealt with in the patent in suit.
- 7.5 Therefore, the Board takes the view, that the subject-matter of Claims 1, 8, 12 is based on an inventive step.
- Since the remaining further claims also comprise all the features and limitations considered above with regard to the above independent claims, this finding is also valid for their subject-matter.
8. Consequently, the Board has come to the conclusion that the patent in suit as amended at the oral proceedings meets the requirements of the EPC.



**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the Main Request (Claims 1 to 18) filed at the oral proceedings and after any necessary consequential amendment of the description and the figures.

The Registrar:

The Chairman:

E. Görgmaier

W. Sieber