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**Datasheet for the decision  
of 22 September 2011**

**Case Number:** T 1940/08 - 3.3.10

**Application Number:** 03763651.1

**Publication Number:** 1519912

**IPC:** C07C 209/00

**Language of the proceedings:** EN

**Title of invention:**

Process for increasing the selectivity of the hydrogenation of 4,4'-diaminodiphenylmethane to 4,4'-diaminodicyclohexylmethane in the presence of an N-alkyl-4,4'-diaminodiphenylmethane

**Patentee:**

Evonik Degussa GmbH

**Opponent:**

BASF SE

**Headword:**

Hydrogenation of 4,4'-MDA/EVONIK DEGUSSA

**Relevant legal provisions:**

EPC Art. 54, 123(2)

RPBA Art. 13(1)(3)

**Keyword:**

"Main request: novelty (no)"

"Auxiliary request 1: not admitted into proceedings - late filed - not induced by fresh objection - fresh case"

"Auxiliary request 2: added subject-matter (yes)"

**Decisions cited:**

T 0607/93, T 0401/95

**Catchword:**

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Case Number: T 1940/08 - 3.3.10

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.10  
of 22 September 2011

**Appellant:** BASF SE  
(Opponent) D-67056 Ludwigshafen (DE)

**Representative:** Ellwanger, Arndt  
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**Respondent:** Evonik Degussa GmbH  
(Patent Proprietor) Rellinghauser Straße 1-11  
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**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 21 July 2008  
rejecting the opposition filed against European  
patent No. 1519912 pursuant to Article 101(2)  
EPC.

**Composition of the Board:**

**Chairman:** P. Gryczka  
**Members:** J. Mercey  
F. Blumer

## Summary of Facts and Submissions

- I. The Appellant (Opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition against European patent No. 1 519 912. Claim 1 of the granted patent read as follows:

"Process for the production of 4,4'-diaminodicyclohexylmethane (4,4'-HMDA) by catalytic hydrogenation of a mixture of substances containing 4,4'-diaminodiphenylmethane (4,4'-MDA) as the main component and its mono-Dl[sic]-methyl derivative as a secondary component with increased selectivity with regard to the hydrogenation of 4,4'-MDA in the presence of a heterogeneous hydrogenation catalyst at a temperature in the range of 50 to 220°C and a hydrogen pressure in the range of 1 to 30 MPa, characterised in that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved."

- II. Notice of Opposition had been filed by the Appellant requesting revocation of the patent in its entirety on the grounds of *inter alia* lack of novelty (Article 100(a) EPC). *Inter alia* the following documents were submitted in opposition proceedings:

- (3) EP-A-231 788 and
- (6) US-A-5 360 934.

- III. The Opposition Division held that the subject-matter of granted claim 1 was novel over the disclosure of document (3), since the hydrogenation reaction disclosed therein was always continued until the

conversion of 4,4'-MDA to 4,4'-HMDA was complete. In addition, the yields cited in document (3) were determined by gas chromatography and were given as integrated area percentage of 4,4'-HMDA in the GC-elutable product, such that it could not be concluded therefrom that the feature "terminating the hydrogenation before a 99% conversion of 4,4'-MDA to 4,4'-HMDA was achieved" required by granted claim 1 was disclosed therein. It also held that the invention was sufficiently disclosed, and involved an inventive step, since starting from document (3) as the closest prior art, no document suggested that the selectivity could be increased by stopping the reaction before 4,4'-MDA had been completely hydrogenated to 4,4'-HMDA.

IV. At the oral proceedings before the Board, held on 22 September 2011, the Respondent (Proprietor of the patent) filed an auxiliary request 1 and renumbered the auxiliary request submitted with letter dated 1 April 2009 as auxiliary request 2.

Claim 1 of auxiliary request 1 differed from claim 1 as granted in that the catalyst was further defined as an Ru-supported catalyst with an Ru content of 0.5 to 10 wt.%.

Claim 1 of auxiliary request 2 differed from claim 1 as granted in that the feature "the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved" was replaced by the feature "the hydrogenation is terminated at a conversion in the range of 90% to 98.9%".

V. The Appellant submitted that the subject-matter of granted claim 1 was not novel over the disclosure of document (3), Runs 29 to 34 of Table 1 thereof explicitly disclosing the hydrogenation of a mixture containing 4,4'-MDA and N-Me-4,4'-MDA using a catalyst, temperature and pressure according to granted claim 1 of the patent in suit. The feature "conversion of 4,4'-MDA to 4,4'-HMDA" in claim 1 of the patent in suit meant the quotient of the amount of 4,4'-HMDA formed and the initial quantity 4,4'-MDA, as defined by the Respondent itself in its letter dated 1 April 2009. Such a definition corresponded to the yield of 4,4'-HMDA, which was also given in Table 1 of document (3) in the column entitled "GC YIELD", in Runs 29 to 34 yields of 4,4'-HMDA of 49 to 93% being achieved. With letter of 18 August 2011, the Appellant submitted the results of an experimental repetition of Run 29 of document (3) as Annex 6. Even if the feature "conversion of 4,4'-MDA to 4,4'-HMDA" in granted claim 1 could be interpreted in other ways, this did not detract from the fact that the proposed interpretation corresponding to the yield of 4,4'-HMDA definitely fell under granted claim 1.

The Appellant challenged the admissibility of auxiliary request 1, since it was filed very late in the appeal proceedings and did not contribute to overcoming any of the objections raised during the proceedings, document (3) also disclosing processes according to the patent in suit using a hydrogenation catalyst comprising ruthenium.

The Appellant argued that claim 1 of auxiliary request 2 contained subject-matter extending beyond the content

of the application as filed, contrary to the requirements of Article 123(2) EPC, since there was no disclosure in the application as filed of the hydrogenation being terminated at a conversion in the range 90% to 98.9%, this range being disclosed in the application as filed only in connection with the specific conversion of 4,4'-MDA to 4,4'-HMDA.

VI. The Respondent submitted that the subject-matter of granted claim 1 was novel over the disclosure of document (3), regardless of how the feature "conversion of 4,4'-MDA to 4,4'-HMDA" was interpreted. If this feature meant conversion of 4,4'-MDA, then in Runs 29 to 34 of Table 1, the conversion of 4,4'-MDA was given in the column entitled "GC CONV" as 100%, which was not less than 99% as required by claim 1 of the patent in suit. If the conversion were to be interpreted in the light of paragraph [0040] of the patent in suit, namely as the level of hydrogenation of the aromatic double bonds of the three MDA isomers, said interpretation being supported by document (6), then this value was not provided at all by document (3). The conversion did not correspond to the yield, as submitted by the Appellant, since this would contradict one of the aims of the patent in suit (see paragraph [0016]), namely to achieve the highest possible yield of 4,4'-HMDA, and was contrary to the skilled person's understanding of the term "conversion". Even if the conversion were interpreted as the yield of 4,4'-HMDA, Runs 29 to 34 were still not novelty destroying, since the values for the yield of 4,4'-HMDA were given as the integrated area percentage in the product elutable by gas chromatography, such that one could not determine therefrom the actual amounts of 4,4'-HMDA in the

product. Thus, the feature "the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved" was not directly and unambiguously disclosed in document (3). The Respondent requested that Annex 6 filed by the Appellant on 18 August 2011 not be allowed into the proceedings, since it was filed merely 34 days before the oral proceedings which meant that the Respondent could not perform its own experiments to verify the data provided.

The Respondent submitted that auxiliary request 1 was filed in reaction to the Appellant's late filed Annex 6 and should thus be admitted into the proceedings if the Board admitted Annex 6.

The Respondent submitted that the subject-matter of claim 1 of auxiliary request 2 fulfilled the requirements of Article 123(2) EPC, since a basis for the amendment could be found in granted claim 4 and on page 6, lines 28 to 30 and page 10, lines 22 to 32 (referred to by the Respondent as paragraph [0040] of the granted patent) of the application as filed.

VII. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed, or subsidiarily, that the patent be maintained on the basis of auxiliary request 1 filed during the oral proceedings before the Board, or on the basis of auxiliary request 2, filed as "auxiliary request" with letter dated 1 April 2009.

VIII. At the end of the oral proceedings, the decision of the Board was announced.

### **Reasons for the Decision**

1. The appeal is admissible.

#### *Main request*

2. *Novelty*

2.1 Document (3) discloses in Runs 29 to 34 of Table 1 on page 12 (see also pages 9 and 10) a process for the production of 4,4'-HMDA (referred to in document (3) as PACM; see page 1, lines 7 to 9) by catalytic hydrogenation of a mixture of substances containing 81.6 wt.% 4,4'-MDA and 0.3 wt.% N-methyl-4,4'-MDA (see page 14, lines 18 to 20) in the presence of a heterogeneous hydrogenation catalyst comprising rhodium and/or ruthenium (see Table 1, column "CAT") at a temperature in the range of 185 to 200°C (see Table 1, column "TEMP") and a hydrogen pressure of 5.9 or 6.94 MPa (see Table 1, column "PRESSURE", values given in psig), both Appellant and Respondent agreeing that document (3) disclosed all the features in the preamble of claim 1 of the patent in suit.

2.2 With regard to the characterising feature required by granted claim 1, namely that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved, the Board agrees with the Appellant that this feature means that the hydrogenation is terminated before the quotient of the amount of 4,4'-



HMDA formed and the initial quantity 4,4'-MDA reaches 99%, or, in other words, before 99% of the initial quantity of 4,4'-MDA is transformed into 4,4'-HMDA, which also means before a yield of 4,4'-HMDA of 99% is achieved.

2.3 The yield of 4,4'-HMDA is given in Table 1 of document (3) in the column entitled "GC YIELD", yields of 4,4'-HMDA of 49 to 93% in Runs 29 to 34 being achieved. This range of yields is so broad that, even allowing for measuring error, at least the process wherein the lowest yield is achieved, namely 49% in Run 30, must fulfil the requirement of the characterising feature of claim 1 of the patent in suit that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved, since the authors of document (3) would hardly have described a yield as "but 49%" (see page 14, line 23) when it corresponded to a yield of at least 99%. The process according to claim 1 as granted is thus not novel.

2.4 For the following reasons, the Board is not convinced by the Respondent's submissions in support of novelty.

2.4.1 The Respondent argued that the term "conversion of 4,4'-MDA to 4,4'-HMDA" in the characterising feature of claim 1 could not be interpreted as the yield of 4,4'-HMDA, because it was within the skilled person's common general knowledge that "conversion" and "yield" were not the same, "conversion" referring to the quotient of the amount reacted and the initial quantity of the reactant only, whereas "yield" related to the quotient of the amount of a specific reaction product and the amount of reactant. Furthermore, such an interpretation

would contradict the aims of the patent in suit (see paragraph [0016]), namely to achieve the highest possible yield of 4,4'-HMDA with the highest possible conversion of 4,4'-MDA, wherein the hydrogenation product should have the smallest possible proportion of N-alkyl-substituted derivatives. Since granted claim 1 referred to "conversion", it thus meant conversion of 4,4'-MDA. As such, Runs 29 to 34 of Table 1 of document (3) were not novelty destroying, since the conversion of 4,4'-MDA was given in the column entitled "GC CONV" (see page 9, lines 33 to 34) as 100%, which was not less than 99% as required by the patent in suit.

However, even if the term "conversion" is usually used by the skilled person to denote the proportion of reactant converted, the term used in granted claim 1 is "conversion of 4,4'-MDA to 4,4'-HMDA", which term thus has the additional component of the reaction product which cannot be overlooked. Hence, this term cannot be interpreted as merely conversion of 4,4'-MDA to **any** product and thus does not correspond to the conversion of MDA (GC CONV) given in document (3). Interpreting the feature "the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved" to mean before a yield of 4,4'-HMDA of 99% is achieved, does not contradict the aims of the patent in suit, since in view of the faster rate of hydrogenation of 4,4'-MDA as compared to N-Me-4,4'-MDA, as acknowledged by the Respondent at the oral proceedings before the Board, it is clear that in order to reduce the proportional amount of N-Me-4,4'-HMDA in the 4,4'-HMDA product, the hydrogenation must be stopped before a yield of 4,4'-HMDA (and therefore also a conversion thereto) of 100% is achieved.

2.4.2 The Respondent also argued that the term "conversion of 4,4'-MDA to 4,4'-HMDA" should be interpreted in the light of paragraph [0040] of the patent in suit, namely as the level of hydrogenation of the aromatic double bonds of the three MDA isomers, said interpretation being supported by document (6), wherein the "Conversion" in Tables 1 and 2 was calculated in this manner. Since this value was not provided at all by document (3), this document could not be novelty destroying for the subject-matter of the patent in suit.

However, the description cannot be used to give a different meaning to a feature in a claim which in itself is clear to the skilled reader (see point 2.2 above). Thus an objection of lack of novelty cannot be avoided by reading into claim 1 limitations derived from the description (see T 607/93, point 2.2 of the reasons, not published in OJ EPO). Document (6) is irrelevant to the interpretation of the term "conversion of 4,4'-MDA to 4,4'-HMDA", since this term is not even used therein.

2.4.3 The Respondent finally argued that since the values for the yield of 4,4'-HMDA referred to the integrated area percentage of 4,4'-HMDA in the product elutable by gas chromatography (see page 10, lines 1 to 2), it was not possible to determine therefrom the actual amounts of 4,4'-HMDA in the product, such that it could not be determined whether or not the hydrogenation had been terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% had been achieved, regardless of how the term "conversion" was interpreted.

Although it may be true that it may not be possible to determine absolute values for the amount of 4,4'-HMDA in the product of Runs 29 to 34, claim 1 requires only that the hydrogenation is terminated before a yield of 99% is achieved. The values given for the yield in Table 1 of document (3) are clearly not meaningless, as can be seen from the discussion on pages 13 and 14 of the yields of Runs 1 to 34 which refers variously to "excellent conversion and yields", "acceptably high yields" and "lower yield". Hence, at least the yield in Run 30 of "but 49%" (see page 14, line 23), which is merely 53% of the highest yield of 93% achieved in Run 33, must fulfil the requirement of the characterising feature required by claim 1 as granted, namely that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved.

2.5 Thus, the Board concludes that document (3) discloses a process according to claim 1 of the main request.

2.6 As a result, the Respondent's main request is not allowable as the subject-matter of claim 1 lacks novelty within the meaning of Articles 52(1) and 54(1) and (2) EPC.

#### *Auxiliary request 1*

### 3. *Admissibility*

3.1 Auxiliary request 1 was filed at a very late stage of the appeal proceedings, namely at the oral proceedings before the Board. The Appellant challenged the admissibility of this request on the grounds that it

was late filed and did not contribute to overcoming any of the objections raised during the proceedings.

3.2 According to the Rules of Procedure of the Boards of Appeal (RPBA) published in the OJ EPO 2007, 536, any amendment to a party's case after it has filed its grounds of appeal may be admitted and considered at the Board's discretion and is not a matter as of right (Article 13(1) RPBA). For exercising due discretion in respect of the admission of such a late filed request, it is established case law of the Boards of Appeal that one crucial criterion is whether or not the amended claims of this request are clearly allowable and whether or not those amended claims give rise to fresh issues which the other party can reasonably be expected to deal with properly without unjustified procedural delay (see T 401/95, point 5.2 of the reasons, not published in OJ EPO).

3.3 The Respondent submitted that this new request was filed in reaction to the Appellant's experimental data of Annex 6 filed with letter dated 18 August 2011, and should be admitted into the proceedings if the Board admitted Annex 6. However, Annex 6 is merely the repetition of Run 29 of Table 1 of document (3). The objection of lack of novelty based on Run 29 of this document was not a new novelty objection but was known to the Respondent from the beginning of the appeal proceedings, Annex 6 being filed merely as alleged support for this known objection and thus not justifying the filing of a new auxiliary request at this stage. In addition, the limitation made by the Respondent was *vis-à-vis* Run 29 of document (3), but did not necessarily overcome the novelty objection of

the Appellant with respect to Runs 30 to 34 of document (3), which all use ruthenium-containing catalysts. In any case, the Board has not taken Annex 6 into account in assessing the novelty of the patent in suit *vis-à-vis* document (3), such that this argument of the Respondent must fail.

3.4 Furthermore, the amendment made to claim 1 takes up a feature which was not emphasised in the patent in suit as contributing to solving the problem underlying the invention in any way, the crux of the invention having always lied in the level of conversion of 4,4'-MDA to 4,4'-HMDA and not in the nature of the heterogeneous hydrogenation catalyst, ruthenium-containing catalysts being, in any case, also described in document (3). Therefore, neither the Appellant, nor the Board, could reasonably be expected to deal with the fresh issues arising from said amendment without adjournment of the oral proceedings (Article 13(3) RPBA).

3.5 For these reasons, the Board exercises its discretion not to admit auxiliary request 1 into the proceedings.

#### *Auxiliary request 2*

#### 4. *Article 123(2) EPC*

4.1 Claim 1 is directed to a process for the production of 4,4'-HMDA which is characterised in that the hydrogenation is terminated at a conversion in the range of 90% to 98.9%, original claim 1 being characterised in that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved.

- 4.2 The Respondent submitted in writing that basis for the amendment "the hydrogenation is terminated at a conversion in the range of 90% to 98.9%" was to be found in claim 4 of the granted patent, which corresponds to claim 4 in the application as filed, and at the oral proceedings before the Board, that the basis was to be found on page 6, lines 28 to 30 and page 10, lines 22 to 32 of the application as filed.
- 4.3 However, claim 1 of auxiliary request 2 is not a combination of claims 1 and 4 as originally filed, since claim 1 as originally filed specifies that the hydrogenation is terminated before a conversion of **4,4'-MDA to 4,4'-HMDA** of 99% is achieved and dependent claim 4 as originally filed specifies that the hydrogenation of 4,4'-MDA to 4,4'-HMDA is terminated at a conversion in the range 90% to 98.9%, such that the "conversion" referred to in claim 4 quite clearly refers back to the conversion of **4,4'-MDA to 4,4'-HMDA** specified in claim 1. Present claim 1 does not, however, specify a reference point for the conversion at all, such that original claim 4 cannot provide a basis for the subject-matter of this claim.
- 4.4 The passage on page 6, lines 28 to 30 of the application as filed on which the Respondent relies, specifies that the hydrogenation is carried out up to a 4,4'-MDA conversion in the range of about 90% to 98.9%. However, this passage must be read in the context of the application as a whole, most particularly as being "a preferred embodiment" (see page 6, line 28) of the invention which is defined three paragraphs previously (see page 5, line 30 to page 6, line 7) as being

characterised in that the hydrogenation is terminated before a conversion of 4,4'-MDA to 4,4'-HMDA of 99% is achieved. This interpretation of page 6 of the application as filed is reflected in dependent claim 4 as filed (see point 4.3 above), said claim being the only other point in the application as filed where the conversion range of 90% to 98.9% is specified.

- 4.5 The passage on page 10, lines 22 to 32 cannot support the lack of a reference point for the conversion range in claim 1, since it also refers to the conversion of 4,4'-MDA to 4,4'-HMDA (see page 10, line 29). In any case, this passage merely gives a definition of the conversion given in the subsequent table, and not of the term used in claim 1.
- 4.6 Thus, the Board concludes that claim 1 of auxiliary request 2 extends the subject-matter claimed beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.



**Order**

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

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

C. Rodríguez Rodríguez

P. Gryczka