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**Datasheet for the decision  
of 7 June 2022**

**Case Number:** T 1314/19 - 3.3.03

**Application Number:** 08803348.5

**Publication Number:** 2203407

**IPC:** C08G12/08, C07C209/78,  
C08G73/02

**Language of the proceedings:** EN

**Title of invention:**

PROCESS FOR THE PRODUCTION OF DI- AND POLYAMINES OF THE  
DIPHENYLMETHANE SERIES

**Patent Proprietor:**

Huntsman International LLC

**Opponent:**

BASF SE

**Relevant legal provisions:**

RPBA Art. 12(4)  
EPC Art. 56

**Keyword:**

Admittance of documents - (yes)  
Inventive step - (yes)



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**Case Number: T 1314/19 - 3.3.03**

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 7 June 2022**

**Appellant:** BASF SE  
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**Respondent:** Huntsman International LLC  
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**Decision under appeal:** **Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
25 February 2019 concerning maintenance of the  
European Patent No. 2203407 in amended form.**

**Composition of the Board:**

**Chair** O. Dury  
**Members:** D. Marquis  
C. Almberg

## **Summary of Facts and Submissions**

I. The appeal by the opponent lies against the interlocutory decision of the opposition division in which it was found that European patent No. 2 203 407 as amended according to the claims of auxiliary request 1 filed on 5 January 2018 and an adapted description met the requirements of the EPC.

II. Claim 1 of auxiliary request 1 reads as follows:

"1. Process for the production of aromatic polyamines comprising the steps of

(a) reacting aromatic amine and formaldehyde in the presence of an acid catalyst to produce a reaction mixture containing di- and polyamines;

(b) neutralising the reaction mixture containing di- and polyamines;

(c) separating the neutralised reaction mixture into an organic phase containing di- and polyamines and an aqueous phase;

(d) further treating the organic phase separated off in step (c) to produce purified di- and polyamines by (d1) washing the organic phase separated off in step (c) with water or other solvent followed by (d2) separating the washed mixture into an organic phase and an aqueous phase and (d3) further fractionation of the organic phase to produce purified di- and polyamines on the one hand and aromatic amine/water on the other hand;

characterised in that phase separation in step (c) is facilitated by using the following method:

(A) removal of some of the water by evaporation from the neutralised reaction mixture obtained in step (b) before the separation step (c);

wherein the acid catalyst is hydrogen chloride and the molar ratio of hydrogen chloride to formaldehyde [expressed as CH<sub>2</sub>O equivalents] is from 0.1 to 0.2 and the aniline to formaldehyde molar ratio is in the range from 2.0 to 3.5, and

wherein the aromatic amine is aniline and the aromatic polyamine is di- and poly(diamino diphenyl methane)".

III. As far as it is relevant to the present appeal, the decision of the opposition division can be summarized as follows:

- D1 (EP 1 616 890 A1) was the closest prior art for claim 1 of auxiliary request 1. This document disclosed a process for the preparation of diamines and polyamines, from which the process of said claim 1 at least differed in step (A) as defined in the characterising part of the claim.
- There was "no example and comparative example" showing an improvement in the phase separation caused by the removal of water by evaporation from the neutralised reaction mixture in step (A) of claim 1. The problem was thus the provision of an alternative process for the phase separation in the production of aromatic polyamines.

- None of the available prior art documents, in particular none of D3 (Organikum, Organisch-Chemisches-Grundpraktikum, VEB Deutscher Verlag der Wissenschaft, Berlin 1977, vol.15, page 79), D4 (Analytiker-Taschenbuch, Berlin, Heidelberg, New York: Springer 1995, vol. 13, page 149) or D5 (US 3 476 806), gave a hint to remove some of the water by evaporation from the neutralised reaction mixture obtained in step (b) before the separation step (c) as in claim 1. Therefore, claim 1 of auxiliary request 1 was inventive starting from D1.

- IV. The opponent (appellant) lodged an appeal against that decision. Together with their statement of grounds of appeal, the appellant also submitted documents D7 (Ullmann's Encyclopedia of Industrial Chemistry; Sixth Edition, Year: 2003; Volume 11; pages: 665-703) and D8 (US 2 734 038).
- V. The patent proprietor (respondent) filed a main request and auxiliary requests 2 to 5 with their reply to the statement of grounds of appeal.
- VI. Oral proceedings took place by videoconference on 7 June 2022 in the presence of both parties.
- VII. The appellant requested that the appealed decision be set aside, that the patent be revoked, and that documents D7 and D8 be admitted into the proceedings.
- VIII. The respondent requested that the appeal be dismissed (main request), or that the patent be maintained in amended form based on the claims of one of auxiliary requests 2 to 5 filed with the reply to the statement of grounds of appeal, and that D7 and D8 not be

admitted into the proceedings.

- IX. The appellant argued essentially that claim 1 of the main request lacked an inventive step starting from D1 also considering the teachings of D7, D8, D3 and D4.
- X. The respondent argued mainly that claim 1 of the main request involved an inventive step starting from D1 also considering the teachings of D7, D8, D3 and D4.

### **Reasons for the Decision**

- 1. Admittance of documents D7 and D8
  - 1.1 D7 and D8 were submitted by the appellant with their statement of grounds of appeal in 2019. Therefore, the admittance of these documents is subject to the stipulations of Article 12(4) RPBA 2007 (see Articles 24(1) and 25(1) and (2) RPBA 2020), according to which the Board has the power to hold inadmissible facts and evidence which could have been presented in the first instance proceedings.
  - 1.2 The respondent argued, in essence, that D7 and D8 were indeed such belated evidence, very specific thus not representing common general knowledge, and not *prima facie* relevant.
  - 1.3 The Board notes that D7 is an excerpt of an encyclopaedia about emulsions in general but with a specific section about the breaking of emulsions (pages 684/685). D7 by its very nature represents common general knowledge in the field of emulsions and the passage cited by the appellant in appeal concerns the basic knowledge of that field, teaching the breaking of emulsions (page 685: section "Dilution, Evaporation,

and Freezing"). D8, and in particular the passage in column 2, lines 23-47, is cited by the appellant to confirm the general knowledge of D7 that evaporation can be used to break emulsions.

1.4 In the Board's view, both D7 and D8 were filed in reaction to the reasoning of the opposition division on inventive step, in particular to the last paragraph on page 11 of the decision in which the opposition division concluded that none of the prior art documents pointed at the separation by evaporation of two phases obtained from the production of aromatic polyamines. This view is underpinned by the fact that this point had not been addressed as a relevant point of inventive step prior to the decision of the opposition division, especially not in the summons to oral proceedings onwards; in the accompanying preliminary opinion of the opposition division, the inventive step assessment was based on a different feature, namely the molar ratio of hydrogen chloride to formaldehyde in the process (page 10, first and last paragraphs).

1.5 Thus the filing of D7 and D8 only on appeal is considered as a legitimate and timely reaction to the contested decision. Therefore the Board considers it not justified to hold D7 and D8 inadmissible pursuant to Article 12(4) RPBA 2007. For these reasons, these two documents are in the proceedings.

2. Inventive step - Main request

2.1 It is undisputed that the main request in appeal corresponds to auxiliary request 1 filed on 5 January 2018 before the opposition division (thereafter the main request) on which the decision under appeal is

based.

- 2.2 The patent in suit concerns a process for the production of aromatic polyamines by reacting the aromatic amine aniline with formaldehyde in the presence of an acid catalyst to produce a reaction mixture containing di- and polyamines (paragraph 30). More specifically the patent in suit aims at processes using low amounts of acid (paragraphs 7, 25, 27, 44 and example 1) as reflected by the molar ratio of hydrochloric acid to formaldehyde of from about 0.1 to about 0.2 and according to the definition given in paragraph 28 of the patent in suit.
- 2.3 The decision of the opposition division identified D1 as the closest prior art. The choice of D1 is not disputed by the parties in appeal. The appellant based their objection of lack of inventive step on the description in D1 that relates to a process for the production of aromatic polyamines from aniline and formaldehyde in the presence of an acid (pages 3-5 of the statement of grounds of appeal mentioning paragraphs 1, 16, 18, 26, 38 and 40 of D1). That process of D1 is analogous to that of the patent in suit.
- 2.4 In particular, the most relevant starting point for assessing inventive step of the patent in suit from D1 is the one that concerns the preparation of aromatic polyamine by the acidic process that is described in paragraphs 8, 18, 26, 35 in D1. Both parties acknowledged at the oral proceedings before the Board that they shared that point of view, which had been indicated in the Board's communication (sections 8.3 to 8.7). D1 does not explicitly aim at low acid catalyst amounts in the preparation process but the level of



protonation disclosed in its paragraph 22 (lower than 15%) indicates that the process of D1 could also be operated with low amount of acid catalyst.

- 2.5 Claim 1 of the main request sets out that the molar ratio of aniline to formaldehyde molar ratio is in the range from 2.0 to 3.5 and the molar ratio of hydrogen chloride to formaldehyde is from 0.1 to 0.2. The appellant argued that these ranges were anticipated by D1 and in particular by the teaching of paragraphs 22 and 23 of that document.
- 2.5.1 Paragraph 23 concerns the molar ratio of aniline to formaldehyde used in the processes of D1. It discloses that a commonly used molar ratio of aniline to formaldehyde is 1.5:1 to 6:1 and preferably 1.8:1 to 5:1. Each of these two ranges disclosed in D1 encompass the molar ratio defined in claim 1 of the main request (2.0 to 3.5) but they do not anticipate it.
- 2.5.2 D1 does not explicitly disclose a range for the molar ratio of acid to formaldehyde. The appellant however calculated a range for that ratio from one of the preferred ranges (5 to 13%) defining the degree of protonation disclosed in paragraph 22 of D1. That calculation also requires the selection of the preferred range of aniline to formaldehyde of 1.8:1 to 5:1 disclosed in paragraph 23. The calculated range of acid to formaldehyde obtained by the appellant (0.09 to 0.65, passage on pages 5/6 in the statement of grounds of appeal) formally encompasses the range defined in claim 1 of the main request (0.1 to 0.2).
- 2.5.3 The respondent argued that the range for the molar ratio of acid to formaldehyde calculated by the appellant could not be seen as being clearly and

directly derivable from D1. The Board shares the view of the respondent. In order to obtain the range of acid to formaldehyde calculated by the appellant, the skilled reader of D1 has to perform a twofold selection of specific ranges disclosed for the ratio of aniline to formaldehyde in paragraph 23 and for the degree of protonation in paragraph 22. It has however not been established by the appellant that the selected ranges, even if they are individually disclosed as being preferred in the broad disclosure of D1, would have been combined with one another in the specific context of the acid catalysed reaction of aniline with formaldehyde, let alone in the presence of hydrochloric acid. In addition, the range calculated by the appellant encompasses the range specified in claim 1 of the main request so that here again a selection within the - calculated - broadest disclosure of D1 has to be made in order to arrive at the range aimed at.

2.6 It follows that D1 cannot be seen as anticipating the combination of ranges defined for the molar ratios of acid to formaldehyde and aniline to formaldehyde in claim 1 of auxiliary request 1, in particular not for a process according to the acidic reaction of aniline and formaldehyde.

2.7 D1 discloses the neutralisation of the acidic reaction mixture with a base (paragraph 38) and the subsequent separation of the organic phase from the aqueous phase as well as a possible washing of the organic phase leading to a separation of the produced aromatic polyamines. Claim 1 of the main request however sets out that further separation from the neutralised reaction mixture obtained in step (b) is taking place before the separation step (c). That step is however not disclosed in D1, a difference that was not in

dispute between the parties in appeal.

2.8 The Board therefore identifies three distinguishing features of claim 1 of the main request over D1, namely i) the range defining the molar ratio of hydrogen chloride to formaldehyde, ii) the range defining the molar ratio of aniline to formaldehyde, and iii) the removal of some of the water by evaporation from the neutralised reaction mixture as defined in step (A) of the process being claimed.

2.9 The respondent contended at the oral proceedings before the Board that the problem solved over D1 was to speed up the separation process of the organic phase from the aqueous phase of the neutralised reaction mixture. The patent in suit however does not establish by evidence the presence of that effect causally linked to any of the distinguishing features of claim 1 of the main request over the process of D1. In any case, considering that the Board concludes that an inventive step is present if the problem solved over D1 resides in the provision of a further process for the preparation of aromatic polyamines from aniline and formaldehyde in the presence of hydrochloric acid, as put forward by the appellant at the oral proceedings before the Board, that formulation of the problem is, to the appellant's benefit, hereinafter considered.

2.10 In that respect, an issue in dispute between the parties was whether it was shown that a skilled person would have considered the removal of some of the water of the reaction mixture by evaporation as defined in step (A) of claim 1 of the main request in order to solve the problem posed. However, it was not disputed that the closest prior art D1 did not contain an indication that evaporation as defined in claim 1 of

the main request would be a solution to the problem. The appellant considered at the oral proceedings before the Board that D7 and D8 rendered the solution provided in the patent in suit obvious starting from D1. The respondent however considered that neither D7 nor D8 dealt with the separation of phases of a reaction mixture as that disclosed in claim 1 of the main request. D7 and D8 therefore would not have been consulted by the skilled person.

2.11 As mentioned, D7 is an extract of an encyclopedia that concerns emulsions, their preparations, their properties and how emulsions can be broken (pages 684/685). Section 1 on pages 666/667 contains general definitions of existing emulsions and how these can be prepared by emulsification in the presence of an emulsifier (page 666, second paragraph). The use of an emulsifier is discussed throughout D7 and also in the passage disclosing the evaporation step on page 685.

2.12 The process for the production of aromatic polyamines according to D1 however does not disclose the preparation of emulsions as defined in D7. Thus, it is questionable whether the teachings of D7 would have been considered by the skilled person starting from D1. In particular, while the closest prior art D1 addresses the separation of reaction mixtures in an organic and an aqueous phase, respectively (paragraph 40), no evidence was provided that these reaction mixtures of D1 could be seen as emulsions in the sense of D7. In that regard, the Board finds that it would not have been obvious to apply the teaching of D7 to the separation of the reaction mixture of the process disclosed in D1.

- 2.13 Besides, the passage on page 685 found to be relevant by the the appellant is one that teaches evaporation of the external phase of an emulsion, ultimately leaving the internal phase and the emulsifier. That teaching, even if it were applied to the separation of the reaction mixture of D1 disclosed in paragraph 40, would not have led to claim 1 of the main request since the external phase in D1 is an organic phase containing aniline and not water. Evaporating the external phase in D1 would thus not have resulted in a removal of water as set out in claim 1 of the main request. The teaching of D7 therefore would not have led to the object of claim 1 of the main request. There is no further teaching of a removal of water by evaporation in D7 that would have been applicable to the process of D1.
- 2.14 D8 relates to a specific process for the recovery of oil and petroleum sulfonates contained in petroleum emulsions produced as the result of the neutralization of acid treated petroleum fractions (column 1, lines 15-18). D8 discloses the use of evaporation for breaking emulsions but the teaching of D8 is remote from the technical context of the patent in suit since it does not relate to the production of aromatic polyamines, where low amount of acid is used, and it lacks a teaching that could be generally applied to the process of D1. It is in that regard doubtful whether a skilled person would have even consulted D8 when starting from the process of D1.
- 2.15 D3 and D4 were also briefly cited as combination documents showing that emulsions could be broken in two separate phases but since none of D3 and D4 concerns the breaking of emulsions by application of an evaporation step, neither D3 nor D4 can be seen as

providing a teaching leading to claim 1 of the main request.

2.16 Consequently, starting from the preparation process of aromatic polyamides in the presence of an acidic catalyst disclosed in the closest prior art D1, the evidence provided by the appellant does not show that the skilled person would have arrived in an obvious way at the process falling within the ambit of claim 1, in particular to a process comprising a step (A) as defined therein. At least for that reason, the arguments and evidence provided in appeal are not such that the decision of the opposition division on the question of inventive step must be overturned.

## Order

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

The appeal is dismissed.

The Registrar:

The Chair:



A. Pinna

O. Dury

Decision electronically authenticated