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**Datasheet for the decision
of 23 March 2011**

Case Number: T 2000/07 - 3.3.01

Application Number: 00202657.3

Publication Number: 1072599

IPC: C07D 301/12

Language of the proceedings: EN

Title of invention:

Process for the preparation of olefin oxides

Patentee:

Dow Global Technologies LLC

Opponent:

Evonik Degussa GmbH

Headword:

Olefin epoxidation/DOW

Relevant legal provisions:

EPC Art. 54, 111(1)

Relevant legal provisions (EPC 1973):

-

Keyword:

"Novelty (yes): not all features disclosed in combination"
"Remittal (yes): inventive step to be discussed"

Decisions cited:

G 0009/91

Catchword:

-



Case Number: T 2000/07 - 3.3.01

D E C I S I O N
of the Technical Board of Appeal 3.3.01
of 23 March 2011

Appellant: Dow Global Technologies LLC
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Respondent: Evonik Degussa GmbH
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 15 October 2007
revoking European patent No. 1072599 pursuant
to Article 102(1)(3) EPC 1973.

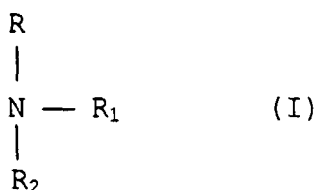
Composition of the Board:

Chairman: P. Ranguis
Members: L. Seymour
L. Bühler

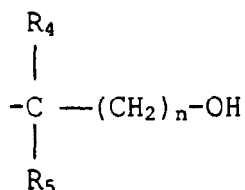
Summary of Facts and Submissions

I. European patent No. 1 072 599, claiming a priority date of 27 July 1999, was granted on the basis of one independent claim and twenty-three dependent claims. Claim 1 as granted reads as follows:

"1. A process in continuous for the preparation of olefin oxides by the direct epoxidation of an olefin with hydrogen peroxide, or compounds capable of producing hydrogen peroxide under the reaction conditions, in a solvent medium, in the presence of a catalytic system consisting of a zeolite containing titanium atoms and a nitrogenated base having general formula (I)



wherein: R, R₁ and R₂, the same or different, can be H, an alkyl group with C₁-C₁₀ carbon atoms, or a



group, wherein n is a number ranging from 1 to 10 and R₄ and R₅ are H or an alkyl group with C₁ -C₁₀ carbon atoms, on the condition that R, R₁ and R₂ are not contemporaneously H."

II. An opposition was filed and revocation of the patent in its entirety requested, pursuant to Article 100(a) EPC for lack of novelty and inventive step.

III. The following documents were cited *inter alia* during the opposition/appeal proceedings:

- (1) WO 00/17178
- (1a) US 09/158,396
- (2) EP-A-0 757 045

IV. The appeal lies from the decision of the opposition division revoking the patent under Article 102(1),(3) EPC 1973.

The decision was based on a main request, namely, the claim set as granted, a first auxiliary request filed with letter of 22 December 2005, and a second auxiliary request filed during oral proceedings before the opposition division.

With regard to the main request, the opposition division referred to document (1) as constituting prior art under Article 54(3) EPC, and considered the subject-matter of claim 1 to lack novelty over the disclosures of documents (1) and (2).

V. The appellant (patentee) lodged an appeal against this decision. With the statement of grounds of appeal, the appellant maintained its main request (claims as granted), and filed three auxiliary requests.

VI. The respondent (opponent) filed counterarguments.

VII. Oral proceedings were held before the board on 23 March 2011.

VIII. The appellant's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

The appellant argued that the claims of document (1) were not entitled to the priority date based on document (1a), and could not therefore be invoked in order to attack novelty. Moreover, a novelty objection based on the description of document (1) must fail since multiple selections were required in order to arrive at the subject-matter of claim 1 of the patent in suit.

With respect to document (2), the appellant observed that the catalyst system employed therein necessarily comprised a specific salt, in addition to a titanium-containing molecular sieve catalyst and a chelating agent. In contrast, the wording "consisting of" used in claim 1 of the patent in suit excluded the presence of salts according to document (2). In addition, document (2) did not directly and unambiguously disclose all the features of claim 1 of the patent in suit in combination.

IX. The respondent's arguments, insofar as they are relevant to the present decision, can be summarised as follows:

The respondent based its novelty attack on the description of document (1), since this was identical in wording to that of document (1a) and therefore clearly enjoyed an earlier priority date than the

effective date of the patent in suit. The claims were, in any case, not decisive for the case against novelty. With reference to the last paragraph on page 2, the respondent noted that document (1) generally related to a method of olefin epoxidation with hydrogen peroxide in the presence of a titanium-containing zeolite catalyst and a tertiary amine or oxide thereof. A continuous process in the presence of a solvent was disclosed as a preferred embodiment in the passage on page 7, line 23 to page 8, line 1. On page 9, line 23, "alkyl dimethyl amines" were explicitly listed as suitable tertiary amines, especially where alkyl was C₁-C₁₈ hydrocarbon. This disclosure of C₁-alkyl, individualised trimethylamine as a preferred tertiary amine. Based on this analysis, it was submitted that no selection was required in order to arrive at the subject-matter of claim 1 of the patent in suit, since all the relevant features were recited as being preferred in document (1). Therefore, novelty was to be denied.

Whilst acknowledging that the presence of specific salts was a mandatory feature of the process of document (2), the respondent argued that this was also not excluded by the wording of claim 1 of the patent in suit. In the absence of a clear definition of the expression "catalytic system" in the patent in suit, the skilled person would understand this to encompass only components that served to increase the rate of the chemical reaction. This did not include salts such as those disclosed in document (2), which were known to have an unfavourable effect on catalytic activity. Therefore, although the "catalytic system" according to claim 1 of the patent in suit did not include a salt

component, this did not exclude the presence of additional salts in the reaction mixture as a whole. This reading was consistent with paragraph [0018] of the patent in suit, which referred to the neutralisation of acidity by compounds of formula (I), a process that would necessarily produce salts in the reaction mixture. It could thus be inferred that the presence of salts was not excluded.

Furthermore, with reference to dependent claims 10 and 15, the respondent submitted that document (2) disclosed a continuous process in a solvent as a preferred embodiment. With this as a starting point, the only additional feature required in order to arrive at the subject-matter of claim 1 of the patent in suit was the choice of the chelating agent. A nitrogenated base of formula (I), namely, triethanol amine, was specifically disclosed in document (2) on page 5, line 37. Thus, a multiple selection from lists of equivalent alternatives was not required, and document (2) was therefore also to be seen as prejudicial to the novelty of the subject-matter claimed in the patent in suit.

- X. The appellant (patentee) requested that the decision under appeal be set aside and that the patent be maintained in the form as granted (main request), or, alternatively, on the basis of one of the three auxiliary requests filed with the statement of grounds of appeal. The appellant (patentee) further requested remittal to the department of first instance for further prosecution.

The respondent (opponent) requested that the appeal be dismissed.

XI. At the end of the oral proceedings, the decision of the board was announced.

Reasons for the Decision

1. The appeal is admissible.
2. *Novelty of the main request, i.e. claims as granted (Articles 52(1), 54 EPC)*

The present process relates to an olefin epoxidation with hydrogen peroxide characterised in that it is continuous and in that it takes place in a solvent medium, in the presence of a catalytic system consisting of a zeolite containing titanium atoms and a nitrogenated base of formula (I) (cf. point I above).

In the decision under appeal, the subject-matter of claim 1 of the main request was found to lack novelty with respect to documents (1) and (2).

2.1 *Document (1)*

- 2.1.1 Document (1) can only be considered as state of the art according to Article 54(3) EPC in so far as it is entitled to the priority date of 22 September 1998 derived from document (1a). This was not disputed by the parties. The parties were also agreed on the fact that the descriptions of documents (1) and (1a) were virtually identical, and that the claimed priority was

valid for this subject-matter. The board notes that differences are to be found in the number, wording and dependencies of the claims in the two documents. Thus, for example, claim 1 of document (1a) comprises a functional limitation with respect to the amount of additive present ("an amount ... effective to improve selectivity to epoxide"), which is not to be found in claim 1 of document (1). However, for the purpose of this decision, the question of entitlement of the claims to the priority right need not be analysed further, since the respondent no longer relied on the claims of document (1) for its novelty attack (cf. point IX, above). The analysis below therefore also only refers to the description of document (1).

- 2.1.2 It is noted that there is no single passage or embodiment in document (1) disclosing all the features of present claim 1 in combination. The question therefore arises whether a direct and unambiguous disclosure can be found in document (1) that would inevitably lead the skilled person to something falling within the scope of claim 1 of the patent in suit.

Document (1) generally relates to a method of olefin epoxidation with hydrogen peroxide in the presence of a titanium-containing zeolite catalyst and a tertiary amine or oxide thereof (see page 2, lines 20 to 23).

The section on page 8, line 5 to page 11, line 8 elaborates on the nature of the preferred tertiary amine and tertiary amine oxides. Amongst the additives listed are "alkyl dimethyl amines (esp. where alkyl = C₁-C₁₈ hydrocarbon) ... and oxides thereof" (see page 9, lines 23 and 30).

On page 12, lines 6 and 7, it is disclosed that the epoxidation process may be carried out in a batch, continuous, **or** semi-continuous manner. In the following paragraph, it is stated that "epoxidation **may** be performed in the presence of a suitable solvent" (emphasis added).

Consequently, in order to arrive at a process as defined in present claim 1, the skilled person would have to:

- select the additive as being a tertiary amine rather than a tertiary amine oxide,
- select a particular structure of additive from a long list of possible alternatives,
- select to perform the reaction in continuous mode, and
- select to perform the reaction in a solvent.

Thus, the combination now claimed results from a selection of particular features from different parts of document (1).

2.1.3 Contrary to the respondent's argument, the board cannot accept that this particular combination of features emerges directly and unambiguously from the disclosure of document (1).

In its analysis, the respondent in particular referred to the passage of document (1) on page 7, line 23 to page 8, line 1, which reads as follows:

"In a preferred embodiment, however, the tertiary amine or oxide is introduced into the reaction zone

separately from the catalyst during epoxidation. For example, the tertiary amine or oxide may be suitably dissolved in the hydrogen peroxide feed, which typically will also contain a relatively polar solvent such as water, alcohol, and/or ketone. In a continuous process, the concentration of tertiary amine or oxide in the feed entering the reaction zone may be periodically adjusted as desired or necessary in order to optimize the epoxidation results attained."

This passage is embedded in a paragraph comprising two embodiments, namely, one in which the catalyst is pretreated (see page 7, lines 15 to 23), and one in which the additive is introduced separately. From the syntax of this paragraph, it is therefore clear that the expression "in a preferred embodiment" is intended to express a preference for the latter embodiment over the former. It is left open in the first sentence of the cited passage whether the process is conducted as a batch, continuous, or semi-continuous process. In the second sentence of the cited passage, the presence of a solvent cannot be considered to be a mandatory feature owing to the use of the term "typically". The third sentence merely recommends a particular procedure when the reaction is conducted as a continuous process. Therefore, it cannot be accepted that a continuous process in the presence of a solvent emerges as being a particularly preferred embodiment from the cited passage.

Indeed, on reading the document as a whole, no clear preference is given to a continuous process (see also page 6, line 13; page 12, lines 6, 7; page 13,

lines 6, 7). It is noted in this context that a batch process is employed in all the examples of document (1).

Moreover, the class of nitrogenated base "alkyl dimethyl amines" is independently defined in a separate passage of the description of document (1), as one of a long list of possible alternatives. Contrary to the respondent's assertions, no preference is given therein to this class of additive. In particular, none of the additives appearing in the examples are "alkyl dimethyl amines" (see examples 1 to 27): most are aromatic in nature; in example 10, trimethylamine oxide is used rather than trimethylamine.

It cannot therefore be accepted that there is a clear pointer in document (1) to select the combination of features now claimed.

2.1.4 Accordingly, the process of claim 1 of the patent in suit is considered to be novel over document (1).

2.2 *Document (2)*

2.2.1 The epoxidation process according to document (2) is conducted "in the presence of a titanium-containing molecular sieve catalyst, **a salt** comprising an anionic species and a cation selected from ammonium cations, alkali metal cations, and alkaline earth metal cations and an amount of a chelating agent ..." (cf. claim 1, emphasis added).

According to claim 1 of the patent in suit, the catalytic system is defined as "**consisting of** a zeolite containing titanium atoms and a nitrogenated base

having general formula (I)" (cf. point I above, emphasis added), that is, in terms of a closed list of components which does not include salts.

The respondent argued that the presence of salts as defined in document (2) was nevertheless not excluded by the wording of present claim 1, since said salts did not contribute to increasing the rate of reaction and were not therefore to be seen as belonging to the "catalytic system".

The board cannot accept that the skilled person would derive such a restrictive definition as to the function of the components of the "catalytic system" from the patent in suit. Thus, paragraphs [0014] and [0015] of the patent in suit disclose that the presence of the nitrogenated base component allows "a high conversion and selectivity to be obtained, simultaneously maintaining the stability of the catalytic activity during the reaction". Therefore, in the context of the patent in suit, the skilled person would understand that the term "catalytic system" was being used in a more general sense than that advanced by the respondent, namely, as generally encompassing components that interact with the catalyst to allow a high product efficiency to be obtained.

In document (2), the following is stated with regard to the function of the salt: "it is believed that the salt interacts in a favorable way with the titanium-containing molecular sieve catalyst so as to suppress undesired side reactions such as epoxide ring-opening and solvent oxidation" (see page 4, lines 17 to 20). As outlined in the previous paragraph, this corresponds

to the type of function envisaged for the present nitrogenated bases. Therefore, if present, salts of the type defined in document (2) would be understood by the skilled person to be components of the "catalytic system" within the meaning of the patent in suit. However, according to the wording of claim 1 of the patent in suit, such additional components are excluded, owing to the use of the term "consisting of".

The respondent's arguments based on paragraph [0018] of the patent in suit also cannot succeed, since any salts produced *in situ* as a result of the neutralisation of acidity by compounds of formula (I) would differ from those defined in document (2) in the nature of the cation. This can be deduced from the fact that the list of possible cations according to document (2) does not include ones derived from amines of formula (I) (cf. first paragraph of point 2.2.1 above; see also document (2), page 4, lines 32 to 34).

Consequently, document (2) does not prejudice the novelty of the subject-matter according to claim 1 of the patent in suit, alone for the reason that the salts of the former are excluded as components of the "catalytic system" in the latter.

2.2.2 In addition, it is noted that the passages of document (2) cited by the respondent cannot provide a direct and unambiguous basis for the combination of features as recited in claim 1 of the patent in suit (cf. last paragraph point IX above). Thus, as a starting point, the respondent has singled out two of the nineteen dependent claims, namely, claims 10 and 15, to construct a preferred embodiment by combination with

claim 1. Many of the dependent claims, including claims 10 and 15, refer back to "any one of the preceding claims". Such a general reference cannot be equated with a clear disclosure of a particular combination of claims as preferred embodiment. In a further step, the respondent combines the features of said claims with a specific chelating agent independently defined in a separate passage of the description. In the absence of any specific pointer thereto, the combination of features appearing in claim 1 of the patent in suit cannot be considered to be directly and unambiguously derivable from document (2).

2.2.3 From the above it follows that the subject-matter of claim 1 of the patent in suit is also novel in the light of document (2).

2.3 The board is satisfied that the subject-matter claimed in the patent in suit is not disclosed in any of the further prior art documents cited during the opposition proceedings. Since this was not in dispute between the parties, it is not necessary to give detailed reasons in this respect.

2.4 For the above reasons, it is concluded that the subject-matter of claim 1 is novel. The same is true of dependent claims 2 to 24.

In view of this outcome, there is no need for the board to decide on the lower-ranking requests.

3. *Remittal*

In view of the above conclusion, the reasons given in the contested decision for revoking the patent as granted no longer apply. Having so decided, the board has not taken a decision on the complete case, since the respondent also sought revocation of the patent in suit on the ground that its subject-matter did not involve an inventive step (see point II above). This issue was not addressed in the decision under appeal.

Given that the purpose of the appeal proceedings *inter partes* is mainly to give the losing party the possibility of challenging the decision of the opposition division on its merits (see G 9/91, OJ EPO 1993, 408, point 18), the board finds it appropriate to exercise its discretion under Article 111(1) EPC to remit the case to the first instance for further prosecution, as requested by the appellant. It is noted that the respondent did not have any objections to this course of action.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance for further prosecution.

The Registrar:

The Chairman:

M. Schalow

P. Ranguis