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Datasheet for the decision of 20 May 2015

Case Number:	T 2233/12 - 3.3.06
Application Number:	03761992.1
Publication Number:	1517751
IPC:	B01J37/08, B01J37/14, C07D301/10, B01J23/50, B01J23/68
Language of the proceedings:	EN

Title of invention:
A METHOD FOR IMPROVING THE SELECTIVITY OF A CATALYST AND A PROCESS FOR THE EPOXIDATION OF AN OLEFIN

Patent Proprietor:
SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.

Opponent:
Scientific Design Company Inc.

Headword:
Epoxidation catalyst/SHELL

Relevant legal provisions:
EPC Art. 52(1), 54, 56, 83, 84

Keyword:
Claims - clarity (yes)
Sufficiency of disclosure (yes)
Novelty (yes)
Inventive step (yes)

Decisions cited:
G 0003/14

Catchword:

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Case Number: T 2233/12 - 3.3.06

DECISION
of Technical Board of Appeal 3.3.06
of 20 May 2015

Appellant: (Opponent)	Scientific Design Company Inc. 49 Industrial Avenue Little Ferry New Jersey 07643-1901 (US)
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Respondent: (Patent Proprietor)	SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V. Carel van Bylandtlaan 30 2501 CJ Den Haag (NL)
Representative:	Shell Internationale Research Maatschappij B.V. Shell International B.V. Intellectual Property Services P.O. Box 384 2501 CJ The Hague (NL)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 8 August 2012 concerning maintenance of the European Patent No. 1517751 in amended form.**

Composition of the Board:

Chairman	B. Czech
Members:	E. Bendl
	D. T. Keeling

Summary of Facts and Submissions

I. The appeal by the opponent lies against the interlocutory decision concerning maintenance of the European patent No. EP 1 517 751 in amended form.

II. In the appealed decision the opposition division concluded that the patent in the amended version with the claims according to then pending main request and a description adapted thereto met the requirements of the EPC.

III. The independent claims of said request read as follows:

"*1. A method for improving the selectivity of a supported highly selective epoxidation catalyst comprising silver in a quantity of at most 0.15 g per m*^{2} *surface area of the support, and in addition to silver, a Group IA metal, and one or more selectivity enhancing dopants selected from rhenium, molybdenum, and tungsten, which method comprises*

- *contacting the catalyst with a feed comprising oxygen at a catalyst temperature above 250 °C for a duration of at least 0.5 hours and up to 150 hours, and*
- *subsequently decreasing the catalyst temperature to a value of at most 250 °C.*"

"*8. A process for the epoxidation of an olefin, which process comprises*

- *contacting a supported highly selective epoxidation catalyst comprising silver in a quantity of at most 0.15 g per m*^{2} *surface area of the support, and in addition to silver, a Group IA metal, and one or more selectivity enhancing dopants selected from rhenium, molybdenum, and*

tungsten with a feed comprising oxygen at a catalyst temperature above 250 °C for a duration of at least 0.5 hours and up to 150 hours, and
- *subsequently decreasing the catalyst temperature to a value of at most 250 °C and contacting the catalyst with the feed comprising the olefin and oxygen.*"

"*11. A process for producing a 1,2-diol, 1,2-diol ether, or an alkanolamine, comprising:*
- *obtaining an olefin oxide by a process for the epoxidation of an olefin according to claim 8, and*
- *converting the olefin oxide into the 1,2-diol, the 1,2-diol ether, or the alkanolamine.*"

Claims 2 to 7 and 9 to 10 are dependent on method claim 1 and process claim 8, respectively, and refer to preferred embodiments thereof.

IV. In its statement setting out the grounds of appeal, the appellant submitted that the opposition division erred in its judgement, as the claimed subject-matter was insufficiently disclosed, unclear, lacked novelty with regard to each of documents P10 (WO 97/40933 A1) and P13 (US 5 864 047 B) and did not involve an inventive step, *inter alia* in the light of example 2 of P13, or of a combination of documents P1 (US 6 087 299 B) and P3 (US 4 766 105 B). Together with said statement it also filed further items of evidence, i.e. two documents numbered P19 and P20.

V. In its reply of 13 March 2013 the respondent (patent proprietor) rebutted the appellant's objections and submitted that the claims held allowable by the opposition division (main request at issue) met the requirements of the EPC. The respondent nevertheless filed amended sets of claims as auxiliary requests. Together with its reply, it also filed further items of evidence, i.e. several documents numbered P21 to P35.

VI. By letter of 30 December 2014, the appellant presented further arguments in support of its earlier objections. It also filed additional documents labelled P37 and P38 and submitted that some of the claims according to the auxiliary requests did not meet the requirements of Article 123(2) EPC.

VII. The parties were summoned to oral proceedings and the board issued a communication in preparation for these.

VIII. In its further letter of 20 April 2015, the respondent once more countered the appellant’s arguments. Moreover, it enclosed further documents labelled P39 to P42.

IX. The appellant, in its submission of 20 April 2015, again rebutted the respondent’s arguments and complemented its own, referring also to two further documents.

X. Oral proceedings took place on 20 May 2015. The debate focused on the allowability of the claims according to the main request. The issues addressed were clarity, sufficiency of disclosure, novelty in the light of documents P10 and P13, and inventive step in the light of P13, and of a combination of documents P3 and P1.

XI. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 1 517 751 be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the patent be maintained on the basis of the claims of one of the auxiliary requests 1 to 23, all filed with letter of 13 May 2013

XII. The arguments of the **appellant** concerning the respondent's main request can be summarised as follows:

Sufficiency of disclosure

- The term "*highly selective epoxidation catalyst*" used in the claims had no well-defined meaning. Thus, the person skilled in the art did not know what was meant by this term and how such catalysts could be distinguished from other known catalysts.
- The term "*catalyst temperature*" comprised in the claims was ambiguous and lacked clarity considering the corresponding indications in paragraph [0026] of the description. As no concrete method was indicated in the patent in suit for measuring said temperature, the skilled person was not able to determine it and, consequently, carry out the invention.
- The claimed invention was therefore insufficiently disclosed.

Clarity

- Claim 1 lacked clarity due to the deletion of the term "*precursor of the catalyst*", previously comprised in claim 1 (as granted). A precursor differed from a catalyst in the amount of reduced silver present. As the original wording covered both, the precursor and the catalyst, no distinction between these forms was necessary. The limitation of claim 1 to "*catalyst*" required an indication regarding the amount of reduced silver the catalyst needed to contain in order to be different from a "*precursor*".

Novelty

- P10 disclosed epoxidation catalysts comprising silver, an alkali metal and optionally rhenium. The range of (calculated) silver loadings disclosed overlapped with the range according to claim 1 at issue. Likewise, the range indicated for the operating temperature in the epoxidation process (page 19) overlapped with the range of "*at most 250* °C" indicated in claim 1 at issue. In particular, catalyst A described in the examples of P10 had a silver load of 0,154 g Ag/m^2.
- Given the teaching on page 20 of P10 to subject the catalyst to an activation treatment comprising an additional heating step prior to carrying out the epoxidation process, the subject-matter of claims 1 and 8 lacked novelty vis-à-vis P10.
- Example 2 of P13 was also novelty-destroying for the claimed subject-matter. The catalyst comprised silver, potassium and rhenium compounds. Absent any indications regarding the atmosphere under which the calcination step resulting in the reduced catalyst is carried out, it had to be assumed that it was carried out under standard conditions, i.e. in air. Thus, the example only differed from the claimed subject-matter in terms of the missing silver load, which could, however, be derived from the description of P13.

Inventive step

- At the oral proceedings, the appellant submitted that P13 was the closest state of the art, disclosing epoxidation catalysts containing silver, potassium and rhenium.
- A silver loading of the same order of magnitude as

claimed could be derived from the description of P13. Carrying out the calcination step under air was an obvious measure. Excluding oxygen would technically be difficult. No indication regarding the use of another gas than air was given.

- Therefore, the claimed subject-matter was derivable in an obvious way from P13.
- If document P3 were to be considered as the closest prior art, the claimed method would still lack inventive step in view of a combination of P3 and document P1.

XIII. The arguments of the **respondent** of relevance here can be summarised as follows:

Sufficiency of disclosure

- A catalyst as defined in claim 1 in terms of its components, i.e. comprising silver, a Group IA metal and at least one out of the dopants selected from rhenium, molybdenum or tungsten, was to be considered as a "*highly selective epoxidation catalyst*".
- The "*catalyst temperature*" referred to in the claims could be easily determined by measuring the catalyst bed temperature (e.g. by means of thermocouples) and by calculating the average weight temperature.

Clarity

- The deletion of the term "*precursor of the catalyst*", i.e. one out of two alternatives formerly present, from claim 1 could not lead to a lack of clarity.

Novelty

- Neither P10 nor P13 was novelty-destroying.

- The optional heating step described on page 20 of P10 referred to a specific preparation process and was unrelated to the remaining disclosure of this document.
- Example 2 of P13 neither disclosed the specific silver load nor a feed comprising oxygen.

Inventive step

- P3 was the closest state of the art, but the claimed method was not obvious in view of a combination of P3 with P1.
- However, also when starting from P13 the skilled person could not derive therefrom that the presence of oxygen during an extended heat treatment at temperatures above 250°C could increase selectivity of the epoxidation catalyst.
- Thus, the claimed invention involved an inventive step.

Reasons for the Decision

Main request- Claims as allowed by the opposition division

Sufficiency of disclosure

1. The expression "***highly selective*** *epoxidation catalyst*"

1.1 The appellant argued that this expression had no well-defined meaning. The claims, in contrast to the description, contained no quantitative definition of the selectivity. The "*highly selective epoxidation catalyst*" referred to in the claims was thus neither defined by its selectivity nor by its components (grounds of appeal, page 3, penultimate paragraph). The skilled person could not clearly distinguish embodiments falling under the scope of the claims from other embodiments, even if he took into account paragraph [0019] of the description (grounds of appeal, page 5, penultimate paragraph).

1.2 The respondent submitted that the claims contained features defining the "*highly selective epoxidation catalyst*" according to the invention in terms of its composition (reply of 13 May 2013, page 7, second and third paragraphs).

1.3 The board has no reason for adopting another understanding of the wording of claim 1. In its view an epoxidation catalyst with the compositional features according to claim 1, i.e. "*comprising silver in a quantity of at most 0.15 g per* m^2 *surface area of the support, an in addition to silver, a Group IA metal and one or more* ***selectivity enhancing*** *dopants selected from rhenium, molybdenum and tungsten*" (emphasis added) is a "*highly selective epoxidation catalyst*" within the meaning of the patent at issue.

1.4 Consequently, absent any evidence to the contrary, the board is satisfied that the skilled person is able to identify highly selective epoxidation catalysts suitable to be improved in selectivity by the claimed method, to distinguish them from other epoxidation catalysts and to determine any selectivity improvement achieved.

2. The expression "*catalyst temperature*"

2.1 The appellant pointed out that the "*catalyst temperature*" referred to in the claims was defined as follows in paragraph [0026] of the patent in suit: "*As used herein, the* ***catalyst temperature*** *or the*

temperature of the catalyst bed *is deemed to be the* ***weight average temperature of the catalyst particles***" (emphasis added). Since no further details concerning the measuring and/or determination of the "*weight average temperature of the catalyst particles*" were given in the patent in suit, and since such a concept or definition was also not known from the prior art, the skilled person was not in a position to put the claimed invention into practice. The appellant however conceded that methods to determine the temperature(s) prevailing in a catalyst bed were known as such.

2.2 The respondent held that the terms "*catalyst temperature*", "*temperature of the catalyst bed*" and "*weight average temperature of the catalyst particles*" had to be considered as interchangeable. The "*catalyst temperature*" could easily be determined, e.g. by using a number of thermocouples and by calculating the average temperature based on the mass of respective volume segments of the catalyst bed.

2.3 Taken literally, and absent any further detailed indications, the definition "*weight average temperature* ***of the catalyst particles***" (emphasis added) given in the description (paragraph [0026]) indeed gives rise to questions regarding the meaning of the term "*catalyst temperature*" comprised in the claims.

2.4 The board is, however, convinced that the person skilled in the art of industrial catalysts and catalytic processes would exclude interpretations attributing some importance to the temperature differences between, or even within, individual particles. At the oral proceedings the appellant also conceded that the determination of the temperature of (individual) particles would not make sense in the context of the claimed invention.

2.4.1 More particularly, absent any proof to the contrary, the board is convinced that the skilled person taking into account the whole content of the patent in suit would thus, instead, consider the terms "*catalyst*" "*catalyst bed*" and "*catalyst particles*" to relate in every case to the total amount of catalyst involved. Whenever appropriate, the skilled person can, without undue burden, calculate a weight average temperature from temperature values measured in a conventional manner (e.g. by means of thermocouples) at different locations across the entire volume of the catalyst bed, said measured temperature being, respectively, representative for a certain volume (and hence weight) fraction of the entire amount of catalyst present.

2.4.2 At the oral proceedings, the appellant emphasised that the "*catalyst temperature*" of 250 °C represented a borderline between the first and the second phase of the method claimed. It therefore considered it to be of utmost importance to have a precise definition of said "*catalyst temperature*". Otherwise, the skilled person, operating close to the temperature of 250 °C would not know whether or not he was carrying out the method according to the invention.

2.4.3 For the board, this objection is, however, rather related to the clarity of a feature that was already present in claims 1 and 8 as granted and is thus not objectionable under Article 84 EPC (see G 3/14 of 24 March 2015, Order). Moreover, besides being convinced that the skilled person is able to determine the "*catalyst temperature*" within the meaning of claims 1 and 8 at issue with sufficient precision, the board finds that by keeping an adequate distance from this critical temperature in both phases of the claimed method, the skilled person can be sure not to be deprived of the promise of the invention. Even accepting *arguendo* that there is some ambiguity implied by the feature in question, such ambiguity does not permeate the whole ambit of claims 1 and 8. Hence, for the board, the insufficiency objection based on this argument in not convincing either.

3. The expression "*surface area of the support*"

3.1 At the oral proceedings, the appellant did not pursue the objection raised in writing (letter of 30 December 2014, point 2) against this feature comprised in claims 1 and 8.

3.2 As was pointed out by the respondent it its reply to said letter, it is indicated in paragraph [0013] of the patent in suit that the surface area of the carrier is deemed to be measured by the B.E.T. method. It was not disputed that this method is well-known.

3.3 The board is thus convinced that the skilled person is in a position to identify, without undue burden, catalysts meeting the criterion "*comprising silver in a quantity of at most 0.15 g* ***per*** $\boldsymbol{m^2}$ ***surface area of the support***" (emphasis added).

4. Based on the above considerations the board concludes that the patent discloses the invention in a manner sufficiently clear and complete to be carried out by the person skilled in the art without undue burden (Articles 100(b)/83 EPC).

Clarity objection

5. In the course of the opposition procedure, the wording of claims 1 and 8 was, respectively, amended as follows: "... *contacting a catalyst,~~ or a precursor of the catalyst comprising the silver in cationic form~~ ...* ".

5.1 The appellant argued that due to deletion of the alternative directed to the "*precursor*", the resulting amended claims at issue lacked clarity. Since the claims did not contain indications regarding the amount of silver that had to be present in reduced form, it would not be clear what should be considered as a "*catalyst*", rather than as a precursor.

5.2 For the board, the skilled person understands that in the context of the patent in suit, a given material qualifies as silver "*catalyst*" for epoxidation when it contains a significant and catalytically effective amount of reduced, i.e. metallic silver, whereas a "*precursor*" will comprise silver essentially in ionic, unreduced form. This understanding is in line with the description of the patent (see e.g. paragraph [0025]): "*By precursor of the catalyst is meant the supported composition which comprises the silver in unreduced, i.e. cationic form, and which further comprises the components necessary for obtaining **after reduction** the intended highly selective catalyst.*" (emphasis added).

5.3 In the board's judgement, the term "*catalyst*" as appearing in claims 1 and 8 is sufficiently clear. Thus, the claims as amended are not objectionable under Article 84 EPC for lack of clarity.

Novelty

6. Document P10

6.1 P10 discloses epoxidation catalysts (page 1, paragraph 1) containing silver and an alkali metal as promoter.

6.1.1 Optionally, it may contain other promoters selected from, *inter alia*, rhenium and rhenium with Mo or W as co-promoters (page 12, lines 12 to 20). The catalysts generally comprise silver in a concentration of 1 to 40 % by weight of the total catalyst (page 12, lines 22 to 28), on a carrier with a surface area between 0.15 to 3.0 m^2/g (page 11, lines 19 to 23). According to the appellant, the calculated silver loading may thus range between 0,0034 and 2,86 g/m^2 support.

6.1.2 As regards the preparation of the catalysts, P10 describes heating the impregnated carriers "to a temperature between about 50 and 600 °C ... to evaporate the liquid an produce metallic silver" (page 16, lines 5 to 9) within "0.5 to 8 hours" (page 16, line 32).

6.1.3 The catalysts are put to use in an epoxidation process comprising feeding ethylene and oxygen to a catalyst at a temperature ranging from 180 to 325 °C (page 19, table I).

6.2 The appellant also pointed to another passage of P10 (on page 20, last paragraph), describing an optional heat treatment of the catalyst at about 350 °C in an oxygen-containing atmosphere for about 4 hours.

6.3 Finally, the appellant invoked the combination of catalyst A of P10 with the passage on page 20 of P10.

6.4 For the board, even when read in combination, the various elements of information contained in P10 invoked by the appellant do not amount to a direct and unambiguous disclosure of a method with all the features of claim 1 at issue for the following reasons.

6.4.1 In the list of components on page 12, lines 13 to 28 for preparing the catalyst, rhenium is only an optional component. Moreover, the range calculated by the appellant as regards the silver loading only overlaps with the one specified in claim 1.

6.4.2 Even considering, *arguendo*, that the final phase of the curing step described on page 16, carried out at a temperature above 250 °C, already is a catalyst treatment (and no longer a treatment of the precursor), a duration of such phase of at least 0.5 hours is not expressly disclosed.

6.4.3 Catalyst A of P10 (page 26, last paragraph; page 29, first paragraph; page 30, table 2, first data row), comprises silver, lithium and rhenium. It has a calculated silver loading of 0,154 g Ag/m^2 support (to be compared to the value of "*0.15*" in claim 1 at issue). The board observes that the preparation of catalyst A comprises curing the impregnated carrier in an air stream "at 240-270°C for 3-6 minutes", but that after that "the cured catalyst" was "ready for testing" (page 29, lines 11 to 15).

Catalyst A was thus **not** subjected to the merely **optional** treatment described on page 20 before being used in an epoxidation process under the general conditions indicated in Table I on page 19 of P10, e.g. at a catalyst temperature under 250 °C.

Furthermore, the board observes that subsequently to the optional calcining step at 350 °C for about 4 hours, the temperature is **not** reduced to less than 250 °C, but the catalyst is subjected to an "*activation treatment*" at 300 to 350 °C in a hydrogen containing atmosphere for more than 1 hour before being "*ready for use*".

6.4.4 In the board's judgement, the skilled person cannot, without the benefit of hindsight, derive from these passages the combination of features according to claim 1. Such a combination would result only from several non-suggested choices to be made within the more general disclosure of P10.

7. Document P13

7.1 Example 2 of P13 describes the preparation and use, in an epoxidation reaction, of a catalyst comprising Ag, potassium and rhenium as promotors, and calcium carbonate as carrier. Example 2 does not mention a specific silver loading value, let alone a value falling within the range specified in claim 1 at issue. Indeed, the specific surface area (in g/m^2) of the calcium carbonate carrier use is not indicated.

7.1.1 The appellant pointed to general indications in P13 (paragraph bridging columns 3 and 4; paragraph bridging columns 5 and 6) concerning the surface area of the support (0.6 to 100 m^2/g) and the silver concentration of the finished catalyst (2 to 70% by weight), deriving therefrom silver load ranges from 0,0034 to 2.86 g Ag/m^2 support, preferably 0.07 to 1 g Ag/m^2 support.

7.1.2 However, the fact that these ranges overlap with the range of "*at most 0.15 g per* m^2" does not establish that a support meeting this latter criterion was actually used according to example 2 of P13.

7.2 Moreover, the preparation of said catalyst includes a calcination step which is briefly described in example 1 of P13 (to which example 2 refers back in this respect) as follows: "*...then calcine at 300°C for three hours to yield the calcium carbonate-supported catalyst*".

In a more general passage of P13 (column 4, lines 44 to 51) invoked by the appellant it is merely stated: "*the slurry is then dried and calcined by placing the mixture in an oven or furnace at about 100 to about 120 °C for 0.5 to 6 hours and then heating the mixture at a temperature of from about 250 °C to about 600 °C for another 1 to 6 hours. This procedure accomplishes drying of the alkaline earth metal compound/silver mixture, removes volatile components and reduces the silver present to its elemental form.*"

7.2.1 No further details are given as regards the gas in contact with the material being treated during said calcination step. However, the use of an inert gas atmosphere during the reducing calcination step is not unusual in the field of silver epoxidation catalysts as can be gathered from the cited prior art (see for instance P7 (WO 96/16734 A1), page 2, line 21 to page 3, line 2; P3, paragraph bridging columns 11 and 12).

7.2.2 Hence, for the board, any views on the presence or absence of oxygen during the heating step are mere assumptions finding no clear and unambiguous basis in D13.

7.3 Thus, based on the above considerations, the board concludes that P13 does not directly and unambiguously disclose a method comprising treating a catalyst as defined in claim 1 at issue, i.e. with a silver loading of "***at most 0.15 g/m^2***" by "*contacting the catalyst with a feed comprising* ***oxygen***".

8. The subject-matter of claim 1 is thus novel (Article 52(1) and 54 EPC) over the prior art invoked by the appellant.

The epoxidation process of independent claim 8, and the production process of independent claim 11 both include the novel selectivity improving method of claim 1. Consequently, their subject-matters, as well as the subject-matter of the dependent claims 2 to 7, 9 and 10, are also novel.

Inventive step

9. The invention

The invention relates to a method for improving the selectivity of a "*supported highly selective epoxidation catalyst comprising silver ... a Group IA metal, and one or more selectivity enhancing dopants selected from rhenium, molybdenum, and tungsten*" and to processes for the epoxidation of an olefin and for producing a 1,2-diol, 1,2-diol-ether or an alkanolamine (claims 1, 8 and 11; paragraphs [0001], [0006] and [0007]) which include said method.

10. Closest prior art

The board accepts that P13 can be considered as the most appropriate starting point for the assessment of inventive step according to the problem-solution approach as submitted by the appellant.

More particularly, this document relates also to supported highly selective catalysts containing alia silver, potassium and rhenium, to be used in the epoxidation of propylene (e.g. see example 2; points 7 *et seq.*, *supra*).

11. Technical problem

In the light of the closest prior art disclosed in P13, the technical problem is, for the board, to be seen in providing a method for improving the selectivity of supported highly selective epoxidation catalysts of the Ag/alkali metal/Rh or Mo or W - type.

12. Solution

As a solution to the above problem, the patent as amended proposes the method according to claim 1 at issue, which is characterised in particular in that the highly selective catalyst comprises

"*silver in an amount of at most 0.15 g/m^2 surface area of the support*"

and is subjected to a heat treatment comprising

"*contacting the catalyst with a feed comprising oxygen at a catalyst temperature above 250 °C for a duration of at least 0.5 hours and up to 150 hours, and subsequently decreasing the catalyst temperature to a value of at most 250 °C*".

13. Success of the solution

13.1 As convincingly demonstrated by the examples of the patent in suit (see Table I), a more pronounced selectivity is indeed obtained when subjecting a highly selective epoxidation catalyst as defined in claim 1 to such a heat treatment: Whereas under nitrogen gas (comparative example 1) the selectivity achieved at a given reaction temperature of 222/224°C was only increased from 82.0 to 84.4 %-mole after of 24h at 260°C, it was increased from 82.0/82.1/83.0 to 88.6/89.3/89.4 %-mole in a gas mixture comprising, besides nitrogen as the main component, 9.4/9.4/7.0 %v oxygen (examples 2 to 4).

13.2 This was not disputed by the appellant. Hence, the board accepts that the technical problem posed is effectively solved by the claimed process and, in the absence of evidence to the contrary, that even small concentrations of oxygen will, to some degree, result in a selectivity increase.

14. Non-obviousness of the solution

14.1 It remains to be decided whether the claimed subject-matter was obvious to a skilled person having regard to the state of the art.

14.2 The appellant argued that starting from the method described in example 2 of P13, implementing those two features which were not disclosed by this example, i.e. a silver loading of "*at most 0.15 g per* m^2 *surface area of the support*" and "*contacting the catalyst with a feed comprising oxygen*" was an obvious thing to do for the skilled person.

14.2.1 It was common ground that the use of high surface supports described in P13 (see column 3, last paragraph) may, in combination with low relative amounts of silver per weight of the support (column 5, last line: "*2 to 70 % by weight*") lead to silver loadings (in g Ag/m^2 support) falling within the range claimed according to claim 1.

For the board said high surface area supports are presented as one alternative which is not presented as preferred compared to supports having lower surface areas. The authors of P13 merely considered the fact that they were "**also** effective" as "surprising" (P13: sentence bridging columns 3 and 4).

14.2.2 However, contacting a catalyst as defined in claim 1, i.e. having a relatively low silver loading, with a feed comprising oxygen, in order solve the technical problem posed, i.e. to provide a catalyst with a particularly pronounced selectivity, is not, in the board's judgement, suggested by P13, when read without the benefit of hindsight.

14.2.3 In the board's judgement, it was thus not obvious to the skilled person unaware of the present invention, to modify the process described in example 2 of P13 such as to arrive at a method falling within the ambit of claim 1 at issue.

15. Further inventive step objections

15.1 At the oral proceedings, the parties also debated the issue of inventive step in the light of a combination of documents P3, taken as the closest prior art, with P1.

For the board, such combination does not lead the skilled person to a method as claimed in an obvious manner for the following reasons.

15.1.1 As pointed out by the respondent, P1, although disclosing (column 6, lines 48 to 59) the "activation" of freshly prepared "catalyst intermediates" comprising a final step of heating them in the presence of oxygen to a temperature of up to 300°C (but preferably only up to 240 °C), is **not** concerned with silver/alkali metal/ **rhenium** catalysts, and proposes to improve the selectivity of silver catalysts comprising alkali and/ or earth alkali metal promoters by including nitrate ions in a lactic acid impregnation solution (column 2, lines 21 to 26, lines 61 to 67).

15.2 Hence, the skilled person seeking to improve the selectivity of Ag/alkali metal/Rh catalyst as disclosed in P3 is not, in the board's judgement, induced by P1 to apply certain measures (activation step) disclosed in P1 to a catalyst according to P3 which must, moreover, have a relatively low a silver loading of at most 0.15 g/m^2 according to claim 1 at issue, although this is not a preferred option according to P3.

15.3 As regards the further inventive step objections that the appellant raised in writing but did not pursue at the oral proceedings, the board is satisfied that they do not establish that a method with all the features was obvious to the skilled person.

16. In the board's judgement, the subject-matter of claim 1 at issue thus involves an inventive step (Articles 52(1) and 56 EPC).

The epoxidation process of independent claim 8 and the

the production process of independent claim 11 both include the inventive selectivity improving method of claim 1. Consequently, their subject-matters, as well as the subject-matter of the dependent claims 2 to 7, 9 and 10, also involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

D. Magliano B. Czech

Decision electronically authenticated