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D E C I S I O N
of 1 June 2005

Case Number: T 0836/02 - 3.3.1

Application Number: 96115484.6

Publication Number: 0767164

IPC: C07C 235/24

Language of the proceedings: EN

Title of invention:
Method for producing a nitrile

Patentee:
Mitsubishi Chemical Corporation

Opponent:
Asahi Kasei Kogyo Kabushiki Kaisha

Headword:
Nitrile/MITSUBISHI

Relevant legal provisions:
EPC Art. 56

Keyword:
"Main and auxiliary request: inventive step (no) - improvement not credible - no fair comparative tests - alternative method - arbitrary selection"

Decisions cited:
T 0020/81, T 0270/90, T 0355/97

Catchword:
-



Case Number: T 0836/02 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 1 June 2005

Appellant:
(Opponent)

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 17 May 2002
rejecting the opposition filed against European
patent No. 0767164 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: A. J. Nuss
Members: R. Freimuth
S. C. Perryman

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal on 22 July 2002 against the decision of the Opposition Division posted on 17 May 2002 rejecting the opposition against European patent No. 767 164 which was granted on the basis of nine claims, the only independent claim 1 reading as follows:

"1. A method for producing a nitrile, which comprises a gas phase catalytic oxidation reaction of an alkane with ammonia in the presence of an oxide catalyst of the empirical formula (1):



(1)

wherein X is at least one element selected from the group consisting of Nb, Ta, W, Ti, Zr, Cr, Mn, Fe, Ru, Co, Rh, Ni, Pd, Pt, B, In, Ce, an alkali metal and an alkaline earth metal; when $a=1$, $0.1 \leq b < 0.99$, $0.01 \leq c < 0.9$, $0 \leq x < 0.89$, and $0.11 \leq (b+c+x) < 1$; and n is a number determined by the oxidized states of other elements, c/b being at most 1."

II. Notice of Opposition had been filed by the Appellant requesting revocation of the patent in suit in its entirety on the grounds of Article 100(a) and (b) EPC, in particular on the grounds of lack of sufficient disclosure, of novelty and of inventive step. *Inter alia* the following document was submitted in opposition proceedings:

(1) EP-A-389 701.

III. The Opposition Division held that the invention was sufficiently disclosed and that the documents cited neither anticipated nor rendered obvious the subject-matter of the patent in suit.

The skilled person was able to carry out the invention on the basis of the description and the examples of the patent in suit in combination with routine experimentation. The Opponent had no difficulties in repeating the drying and the calcination step for preparing the catalysts to be used in the claimed process. With regard to the heating step after drying and prior to calcination it is true that the patent in suit was silent about the length of time to be used for that step. However, the purpose of that treatment, i.e. salt decomposition, gave the skilled person guidance for determining the necessary length of time by means of routine experimentation. Therefore the invention was sufficiently disclosed.

The process according to claim 1 of the patent in suit was considered to be novel over document (1), which described a process for preparing nitriles by a gas phase catalytic oxidation of alkanes with ammonia in the presence of an oxide catalyst. That document generally encompassed the catalysts according to claim 1 but did not disclose specifically a catalyst falling within the ambit of claim 1.

Document (1) was found to represent the closest prior art in the assessment of inventive step. Starting from that document the problem underlying the patent in suit was seen in providing an improved process for the

preparation of nitriles, the improvement lying in higher conversion and yield. None of the documents in the proceedings suggested that the selectivity could be improved by selecting the atomic ratios of the metal components of the catalysts as specified in the patent in suit. Therefore the process of claim 1 was held to be inventive.

IV. The Appellant challenged the sufficiency of disclosure of the present invention. He submitted in this respect that the patent in suit failed to provide information on the specific process conditions of the "salt decomposition" step.

In support of his objection of insufficiency of disclosure the Appellant submitted on 27 September 2002, together with the Statement of the Grounds of Appeal, the Exhibits Q to S, additionally on 11 February 2004 the exhibits T to V, on 9 March 2005 the exhibits W to Y, the document

(4) JP-A-2002-45693,

and the Literatures

(L3) Chemical & Metallurgical Engineering, 1945, pages 100 to 102,

(L4) Metallurgical Transactions B, Process Metallurgy, Volume 21B, pages 1005 to 1011 (1990),

(L5) The AusIMM Proceedings, 1998, pages 11 to 16,

(L6) Engineering System for Fine Particles, Fundamental Technology I, pages 887 to 896 and 945 to 950 (2001),

and, finally, on 18 May 2005 the photographs P-1 to P-4.

In the assessment of inventive step the Appellant argued that the claimed invention was encompassed by the general description of the prior document (1) with the consequence that the patent in suit was merely a so-called "selection invention". The problem underlying the invention was to be seen in a preparation process of nitriles from alkanes which process was improved in respect of yield and selectivity. However, that improvement was not achieved within the whole area claimed as shown in exhibits A, B and K provided in opposition proceedings since catalysts satisfying the requirements defined in claim 1 either completely failed to result in the formation of nitrile or resulted in a much lower yield of nitrile than described in the prior art. Moreover, the Respondent's test report did not properly show the purported improvement vis-à-vis the closest prior art since none of the comparative examples comprised therein reflected the closest document (1). In the absence of any improvement the claimed subject-matter according to the main request was an arbitrary selection and, thus, obvious. Nor, for the same token, was the subject-matter according to the auxiliary request inventive.

- V. The Respondent (Proprietor of the patent) submitted on 29 April 2005 a fresh auxiliary request differing from the main request exclusively in that the feature of granted claim 6, i.e. that the ratio of c/b is 0.5 to 1, was included in granted claim 1.

The Respondent argued with respect to the objection of insufficient disclosure that the teaching of the patent

in suit in combination with common general knowledge enabled the skilled person to carry out the invention.

To rebut the objection of insufficient disclosure the Respondent submitted on 21 February 2003 the fresh Literatures

(L1) Zukai no Kiso Chishiki, pages 160, 164, 165, 171 and 172 (2001) and

(L2) Encyclopedia of powder process industry and technology, page 147 (1974).

The Respondent considered as closest prior art in the assessment of inventive step document (1) which covered the claimed ammoxidation process for preparing nitriles. That document encompassed but did not specifically disclose the catalysts used in the invention. The technical effect achieved by the claimed invention was to improve the process for preparing nitriles in respect of yield and selectivity. This effect was based on the particular atomic ratios of the respective catalyst components as defined in claim 1. To support this submission the Respondent referred to the comparative data comprised in the patent specification, to those provided on 6 March 1998 in examination proceedings and to his exhibit C provided in opposition proceedings. He argued that the yield and the selectivity of nitrile achieved in the process of the patent in suit were superior to those achieved in the process of the comparative examples. Even if the comparative examples in these test reports did not exactly fit in with document (1), they came, at least, close to it thereby making plain that the alleged improvement was in fact achieved. The experimental

comparative data provided by the Appellant in exhibits A, B and K should be disregarded as they did not rework correctly the examples of the patent in suit. Since there was no incentive, either in document (1) or in any other document in the proceedings, to use in a process for preparing nitriles a catalyst wherein Mo, V and Sb were the essential components in particular atomic ratios, the improvement in yield and selectivity was unexpected rendering the claimed invention non-obvious. With respect to the auxiliary request, the limitation to the range of 0.5 to 1 of the atomic ratio of Sb to V aimed at excluding example 13 from the claimed invention, which example showed a very low yield and selectivity. Thus, claim 1 was restricted to subject-matter achieving improved yield and selectivity.

The Respondent challenged the admission into the proceedings of the documents submitted by the Appellant on 11 February 2004 and on 9 March 2005 for their late filing and their lack of relevance.

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

The Respondent requested that the appeal be dismissed and the patent be maintained as granted and subsidiarily that the patent be maintained on the basis of claims 1 to 8 of the auxiliary request submitted on 29 April 2005.

- VII. At the end of the oral proceedings held on 1 June 2005 the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.
2. *Sufficiency of disclosure*

The Appellant objected to the sufficiency of disclosure of the invention. In view of the negative conclusions in respect of the claimed invention according to either request for lack of inventive step as set out in points 4 and 6 below, a decision of the Board on this issue is unnecessary. Having regard to the outcome of the appeal, there is also no need for the Board to take a decision whether or not to admit the Appellant's late filed documents into the proceedings, which documents were provided only to support his objection of insufficient disclosure.

3. *Novelty*

The novelty of the patent in suit was not at issue in this appeal. Although raised as a ground for opposition by him, the Appellant concurred in appeal proceedings with the finding of the Opposition Division rejecting this ground. Nor does the Board see any reason to take a different view. Hence, it is unnecessary to go into more detail in this respect.

Main request

4. *Inventive step*
 - 4.1 According to the established jurisprudence of the Boards of Appeal it is necessary, in order to assess

inventive step, to establish the closest state of the art, to determine in the light thereof the technical problem which the invention addresses and successfully solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art. This "problem-solution approach" ensures assessing inventive step on an objective basis and avoids an *ex post facto* analysis.

- 4.2 The patent in suit is directed to a process for producing a nitrile by ammoxidation of an alkane in the presence of an oxide catalyst.

Such a process already belongs to the state of the art: document (1) discloses in its claim 1 on page 8 a process for producing a nitrile by ammoxidation of an alkane in the presence of an oxide catalyst in the gas phase (page 3, line 39). The oxide catalyst comprises the mandatory components vanadium, antimony and tungsten and *inter alia* the optional component molybdenum (claim 1, page 8, lines 30, 32 and 39). The atomic ratio of Sb to V is 0.01 to 1 and that of W plus optionally Mo to V is 0.2 to 10 while that of Mo to V does not exceed 2 (claim 1, page 8, lines 36 and 37). The Appellant and the Respondent concurred with the finding that this general disclosure of document (1) embraces the oxide catalysts as defined in the process of claim 1 of the patent in suit, but that this document does not specifically disclose such an individual oxide catalyst.

For these reasons, the Board considers, in agreement with the Appellant, the Respondent and the Opposition Division, that document (1) represents the closest

- state of the art, and, hence, the starting point in the assessment of inventive step.
- 4.3 In view of this state of the art the problem underlying the patent in suit is initially to be formulated in the way indicated in the patent specification on page 2, paragraph [0009] and submitted by the Respondent during the appeal proceedings, as providing an ammoxidation process for preparing nitriles which is improved in respect of yield and selectivity.
- 4.4 As the solution to this problem the patent in suit proposes the process according to claim 1 which is characterised by the oxide catalyst according to formula (1) comprising the mandatory components molybdenum, vanadium and antimony and *inter alia* the optional component tungsten wherein the atomic ratios of those metals to Mo is 0.1 to below 0.99, 0.01 to below 0.9 and less than 0.89, respectively, and wherein the atomic ratio of Sb to V is at most 1 and that of V plus Sb plus optionally W to Mo is 0.11 to below 1 (see point I *supra*).
- 4.5 The Appellant and the Respondent were divided as to whether or not the evidence presented convincingly showed the successful solution of the problem defined in point 4.3 *supra vis-à-vis* the closest prior art. To demonstrate that the process using the particular catalysts as defined in claim 1 achieves the alleged improvement in yield and selectivity, the Respondent, who by alleging this fact carries the burden of proving it (see decisions T 270/90 OJ EPO 1993, 725, point 2.1 of the reasons, T 355/97, point 2.5.1 of the reasons, not published in OJ EPO), relied on the test report

comprised in the specification of the patent in suit, on that provided on 6 March 1998 in examination proceedings and on that provided in form of exhibit C in opposition proceedings.

- 4.5.1 Those test reports specify the experimental yield and selectivity data achieved in examples using catalysts according to the invention and in those using catalysts labelled comparative (comparative examples I to III and "catalysts 1 and 2" of exhibit C). None of the catalysts used in the examples labelled comparative comprises tungsten.

The Respondent alleged that these comparative examples convincingly demonstrated the purported superiority in yield and selectivity of the claimed process using the catalysts according to the invention. Although the comparative examples did not exactly fit in with document (1), they came, at least, close to it.

Thus, the Respondent, at the same time, concedes that none of the comparative examples in his test reports comply with the closest prior art. The teaching of the closest prior document (1), which is the starting point in the assessment of inventive step, resides in using catalyst mandatorily comprising tungsten (see point 4.2 *supra*). A catalyst omitting tungsten is outside of the scope of that document. Therefore, when comparing the claimed invention with examples using catalysts which do not form part of document (1), all the Respondent's comparative test reports are deficient in that they cannot truly reflect the teaching of the closest prior art, with the consequence that they do not properly demonstrate the successful achievement of the purported

improvement of the claimed catalysts vis-à-vis the closest state of the art. Thus, none of the Respondent's test reports make a fair comparison, and accordingly cannot be taken into consideration in the assessment of inventive step.

4.5.2 The Appellant, based on his exhibits A, B and K, objected to the purported improvement in respect of yield and selectivity that it was not achieved within the whole area claimed. However, there is no need to deal with that objection as the Respondent's test reports are already deficient for the reasons given in point 4.5.1 *supra* and, thus anyhow are not to be taken into consideration.

4.6 According to the jurisprudence of the Boards of Appeal, alleged but unsupported advantages cannot be taken into consideration in respect of the determination of the problem underlying the claimed invention (see e.g. decision T 20/81, OJ EPO 1982, 217, point 3, last paragraph of the reasons). Since in the present case the alleged improvement, i.e. higher yield and selectivity, lacks the required adequate experimental support, the technical problem as defined in point 4.3 above needs reformulation.

In view of the teaching of document (1), the objective problem underlying the patent in suit can merely be seen in providing an **alternative** ammoxidation process for preparing nitriles.

4.7 Finally, it remains to decide whether or not the proposed solution to that objective problem underlying

the patent in suit is obvious in view of the state of the art.

Document (1) describes an ammoxidation process using oxide catalysts embracing the catalysts used in the claimed ammoxidation process (see point 4.2 *supra*). Thus any catalyst so covered, including oxide catalysts comprising molybdenum, vanadium and antimony and optionally tungsten in the atomic ratios indicated in claim 1 of the patent in suit, is within the ambit envisaged by the general disclosure of document (1) and taught to be suitable for the ammoxidation process.

The Respondent alleged that the particular atomic ratios of the catalyst components were essential for improving yield and selectivity in the claimed process. However, since this purported improvement has not been shown to have been achieved vis-à-vis the closest prior document (1) by using catalysts according to present claim 1 as outlined in point 4.5 *supra* in detail, the particular atomic ratios of the catalyst components cannot be treated as either critical or as a purposive choice for solving the objective problem underlying the patent in suit, but merely as an arbitrary restriction of no technical significance.

On this basis the picking out at random of atomic ratios for the oxide catalysts from the numerical ranges indicated in document (1) can only be seen as lying within the routine activity of the skilled person faced with the objective problem of merely providing an alternative ammoxidation process for preparing nitriles. That cannot provide any inventive ingenuity to the claimed process as it amounts to using those catalysts

for producing only what is to be expected, namely nitriles.

- 4.8 The Respondent, at the oral proceedings before the Board, submitted in support of inventive step that document (1) did not point the skilled person to the claimed atomic ratios of the catalyst components since the atomic ratio of V to Mo in the sole exemplified catalyst comprising molybdenum was 4.6, i.e. outside of the scope of present claim 1.

It is true, that document (1) only describes one individual catalyst comprising molybdenum and for this the atomic ration of V and Mo is above the claimed range. That fact is merely a reason for accepting that it does not anticipate the claimed subject-matter. However, as set out in point 4.7 *supra*, the teaching of a document is not confined to its examples but embraces any information contained therein. As no improvement is attributable to the now claimed atomic ratios over the numerical ranges given in document (1), the Respondent's objection that there is no pointer to the claimed atomic ratios cannot convince the Board because this is asking for a condition to be met which is meaningless in a situation where the claimed solution merely consists in picking out particular atomic ratios at random.

- 4.9 For these reasons, the subject-matter of claim 1 is obvious in the light of document (1).

5. As a result, the Respondent's main request is not allowable for lack of inventive step pursuant to Article 56 EPC.

Auxiliary request

6. *Inventive step*

Claim 1 according to the auxiliary request differs from claim 1 according to the main request exclusively in that the atomic ratio of Sb to V is limited to the range of 0.5 to 1 of claim 6 as granted. At the oral proceedings before the Board the Respondent submitted that this amendment was designed for excluding example 13 from the claimed invention in order to restrict claim 1 to subject-matter achieving improved yield and selectivity.

Document (1) still represents the closest state of the art and the starting point in the assessment of inventive step for the reasons given in point 4.2 above. That document also embraces the atomic ratio of the catalyst components Sb and V indicated in present claim 1. The solution proposed by the patent in suit to the problem as defined in point 4.6 above, i.e. to provide an alternative ammoxidation process, remains to be characterised by the use of an oxide catalyst according to formula (1) comprising Mo, V, Sb and optionally W in specific atomic ratios.

The considerations concerning inventive step given in point 4.7 with respect to the main request are neither based on nor affected by the indication of a limited atomic ratio of Sb to V. Therefore the conclusion drawn in point 4.9 *supra* with regard to the main request still applies for the auxiliary request, i.e. the

subject-matter of claim 1 of that request is obvious and does not involve an inventive step.

7. In these circumstances, the Appellant's auxiliary request is not allowable for lack of inventive step pursuant to Article 56 EPC as well.

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:

U. Bultmann

A. Nuss