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D E C I S I O N
of 14 March 2001

Case Number: T 0465/97 - 3.3.7

Application Number: 90116480.6

Publication Number: 0415347

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Language of the proceedings: EN

Title of invention:

Catalyst for the production of methacrylic acid

Patentee:

NIPPON SHOKUBAI KAGAKU KOGYO CO. LTD.

Opponent:

BASF Aktiengesellschaft

Headword:

-

Relevant legal provisions:

EPC Art. 56, 83, 84, 113(1), 123(2)

EPC R. 67

Keyword:

"Inventive step - problem and solution - specific
relationship of claimed subject-matter to closest prior art -
 unsuspected problem"

"Insufficiency (no) - onus of proof not discharged"

"Reimbursement of the appeal fee (no)"

Decisions cited:

G 0002/88, T 0219/83, T 0035/85, T 0197/86, T 0367/91,

T 0182/92, T 1072/92, T 0351/93

Catchword:

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Case Number: T 0465/97 - 3.3.7

D E C I S I O N
of the Technical Board of Appeal 3.3.7
of 14 March 2001

Appellant: BASF Aktiengesellschaft
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office issued in writing
on 17 March 1997 maintaining European patent
No. 0 415 347 in amended form under
Article 106(3) EPC.

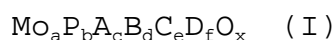
Composition of the Board:

Chairman: R. E. Teschemacher
Members: B. J. M. Struif
R. J. Young

Summary of Facts and Submissions

I. The mention of grant of European patent No. 0 415 347 in respect to European patent application No. 90 116 480.6, filed on 28 August 1990 and claiming two JP-priorities of 29 August 1989 (JP 220380/89) and 6 August 1990 (JP 206857/90) was published on 26 October 1994 (Bulletin 94/43). Claim 1 read as follows:

"A catalyst for the production of methacrylic acid composed of an inert carrier and a catalytically active substance layer deposited on the carrier, the catalytically active substance layer being composed of oxides represented by the following formula (I)



where Mo represents molybdenum, P represents phosphorous, A represents at least one element selected from arsenic, antimony, germanium, bismuth, zirconium, cerium and selenium, B is at least one element selected from copper, iron, chromium, nickel, manganese, cobalt, tin, silver, zinc, palladium, rhodium and tellurium, C represents at least one element selected from vanadium, tungsten and niobium, D represents at least one element selected from alkali metals, alkaline earth metals and thallium, and O represents oxygen, a, b, c, d, e, f and x respectively represent the atomic ratios of Mo, P, A, B, C, D and O, wherein a = 12, b = 0.5 - 4, c = 0 - 5, d = 0 - 3, e = 0 - 4, f = 0.01 - 4, and x is a numerical value determined by the oxidation states of these elements, the catalytically active substance layer being formed by preheating the inert carrier to 100°C to 250°C,

mixing components of the elemental components of the oxides of formula (I), as required heating them to prepare a slurry or a solution, spraying the slurry or solution onto the inert carrier, and calcining the inert carrier having deposited the slurry or solution thereon."

Claim 2 was a dependent claim directed to an elaboration of the catalyst of claim 1. Claim 3 was a further independent claim which read as follows:

"The catalyst for the production of methacrylic acid in which the catalytically active substance layer is of a multilayer structure consisting of at least two layers having different layers."

Claims 4 to 6 were dependent claims directed to elaborations of the catalysts of claim 3.

II. Notice of opposition was filed on the grounds of insufficiency under Article 100(b) EPC and lack of novelty and lack of inventive step under Article 100(a) EPC. The opposition was *inter alia* supported by the following documents:

D1: DE-A-30 30 243

D2: EP-A-0 024 954

D5: DE-A-29 09 670

III. By a decision announced at oral proceedings held on 14 January 1997 and issued in writing on 17 March 1997, the opposition division found that the patent could be maintained in amended form. The decision was

based on a main request including a set of claims 1 to 4 submitted at the oral proceedings on 14 January 1997. Whilst claims 1 and 2 corresponded to claims 1 and 2, respectively, as granted, claim 3 read as follows:

"A catalyst for the production of methacrylic acid in which the catalytically active substance layer is of a multilayer structure consisting of at least two layers having different layers, and in which the catalytically active substance layers of the multilayer structures are formed by mixing compounds containing oxides represented by formula (I) in claim 1, as required heating them to prepare a slurry or a solution, and in spraying the slurry or solution onto the inert carrier preheated at a temperature of 100°C to 250°C, at least two slurries or solutions having different compositions are prepared in advance, and successively sprayed onto the inert carrier".

Claim 4 corresponded to claim 6 as granted.

The decision made reference to:

D6: Test report filed with patentee's letter dated 12 August 1993.

The Opposition Division considered the main request to meet Article 83 EPC because the impugned patent in its entirety disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. From the description it could be derived, under which conditions the spraying of the slurry or the solution and the preheating of the carrier should be carried

out. The opponent's test report, submitted with the notice of opposition concerning example 10 of the patent in suit, did not use the process conditions according to said example.

The measurements of pore diameter distribution, pore volume and specific surface were not relevant to the question whether the catalysts could be obtained in the sense of Article 83 EPC and they could in any case be repeated because methods thereof had been described in the impugned patent. It was, however, not relevant whether these measurements gave accurate values.

Furthermore, the opposition division accepted novelty and inventive step over the cited prior art.

The documents D1, D2 and D5 did not disclose the preheating step of the carrier to the specified temperature of 100-250°C which step resulted in a catalyst having a lower attrition loss compared to the teaching of D5, as had been shown by the test report of the patentee (D6). The opponent had not provided any evidence to the contrary. D4 and D5 established a prejudice against preheating the inert carrier above 100°C.

IV. A notice of appeal against the above decision was filed together with the statement of grounds of appeal on 18 April 1997, the prescribed fee being paid on the same day. The appellant (opponent) argued in substance to insufficiency and inventive step, substantially as follows:

It had been shown in the notice of opposition that catalyst precursor layers on carrier particles could

only be deposited if the carrier particles were sprayed in a rotary drum which was held at the preheating temperature during the whole period of spraying and that when these specific conditions were lacking, no catalyst layers were formed. Although the decision under appeal seemed to accept this experimental finding, the objection under Article 100(b) EPC had nevertheless been rejected. This contradiction in the decision under appeal was an substantial procedural violation which justified the reimbursement of the appeal fee.

Catalysts which did not contain an active substance layer could not be inventive over D1, D2 and D5.

Claims 2 and 4 could not be reproduced, because it was not disclosed how the physical parameters of the active layer could be measured. The reasoning in the decision under appeal concerning the relevance of this to Article 83 EPC was wrong and could not be accepted.

- V. The respondent (patentee) disagreed, in a submission dated 29 August 1997, with the arguments of the appellant and put forward the following objections:

The allegedly lacking feature in claim 1 that the catalyst particles were sprayed in a heated rotating vessel was an objection under Article 84 and Rule 29(1) EPC but not an opposition ground. When the question of sufficient disclosure was to be assessed the patent as a whole and not only the individual claims had to be taken into account. The measuring methods for determining the parameters of claims 2 and 4 had been sufficiently disclosed in the description.

VI. With a communication issued on 22 December 2000 the board expressed a preliminary provisional view on the admissibility of claim 3 of the respondent's requests filed on 14 January 1997 under Articles 123(2) and 84 EPC. Further, the description on page 4 of the impugned patent was objected to as not having been adapted to the claims.

VII. With a submission filed on 14 February 2001 the respondent filed a new set of claims 1 to 4 and an amended description page 4.

The set of claims 1 to 4 differed from claims 1 to 4 of the previous request dated 14 January 1997 only in that in claim 3 the phrase "by mixing compounds containing oxides" had been replaced by the phrase "by mixing compounds containing elemental components of the oxides" and in that, at the end of this claim, the following phrase was added: "and calcining the inert carrier having deposited the slurry or solution thereon".

VIII. Oral proceedings were held on 14 March 2001. During these oral proceedings the board dealt with the issues in the following order:

- (a) Formal objections to claim 3 submitted with letter of 14 February 2001.

By reference to the application as originally filed the parties argued as follows:

According to the appellant the definition of the "baking deposition method" disclosed on page 6, lines 21 to 31 did not include any preheating step of

the carrier. Although page 8, lines 1 to 11 disclosed a preheating of the carrier in connection with a monolayer this was not disclosed with respect to a multilayer structure as claimed and thus involved added subject matter under Article 123(2) EPC.

In reply the respondent disagreed and referred to page 8, lines 7, 8, 27 and 28 of the application as filed, according to which the preheating step was an essential feature also for the multilayer structure.

(b) Insufficiency of disclosure

According to the appellant's objection, the spraying on the preheated carrier had to be carried out in a specific apparatus, in order to provide a catalyst layer, because the preheating temperature disclosed on page 8, lines 1 to 11 referred to both the rotary furnace and the carrier. As the continuation of the preheating during the whole spraying was not defined in the claims and the "mere spraying" ("alleiniges Versprühen") of the carrier preheated to 100°C (notice of opposition; page 4 and 5 bridging paragraph) had proved insufficient to produce a precursor layer of the catalyst on the carrier, the catalyst layers according to the patent in suit could not be reproduced.

Furthermore, the amount of active substance was a critical feature which should be incorporated into the claims (page 8, lines 18 to 26).

According to the respondent's submission not only the individual claims but also the patent as a whole had to be considered when assessing enablement under

Article 83 EPC. All necessary information had been given in the patent in suit, which enabled the skilled person to effectively reproduce the catalyst layer on the carrier.

The appellant's test report mentioned above (notice of opposition; page 4 and 5 bridging paragraph) did not represent a reproduction of the subject matter of the patent in suit, because neither the composition of the catalyst components, nor the deposition and calcination conditions had been specified.

The rotary furnace was furthermore only a preferred feature and the amount of active substance was not an essential feature either under Article 84 EPC.

(c) Inventive step

According to the appellant, the preheating step was the only feature different from the cited prior, but did not provide an efficient catalyst layer so that the claims could not be regarded as inventive. Furthermore, the recognition of an inventive step in the decision under appeal had been based only on a prejudice over D4 and D5, the cited passages of which, however, referred to prior art documents which, in fact, did not establish any prejudice against using the preheating temperatures as claimed.

According to the respondent D5 could be regarded as the closest prior art document. The claimed higher preheating temperature provided a better attrition loss as had been demonstrated by the test report D6. Although the attrition loss according to D5 was low, the catalyst composition and its deposition onto a

carrier were different from what was defined in the claims of the patent in suit, so that the attrition problem in D5 and that according to the claimed invention were not necessarily the same.

During oral proceedings the respondent filed an amended page 6 of the description.

IX. The appellant (opponent) requested that the decision under appeal be set aside and that the patent in suit be revoked. Further, he requested that the appeal fee be reimbursed.

X. The respondent (patentee) requested that the appeal be dismissed and that the patent be maintained on the basis of:

claims 1 to 4 submitted with letter dated 14 February 2001 and the amendments to the description made in this letter and during oral proceedings.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of claim 3 of the main request*

2.1 According to Article 123(2) EPC a European Patent may not be amended in such a way that it contains subject matter which extends beyond the content of the application as filed. The question to be decided is whether the amendment of the preheating temperature of the carrier in the multilayer structure of claim 3 can be directly and unambiguously derived from the

application as filed.

2.1.1 According to this amendment the inert carrier is "preheated to a temperature of 100 to 250°C". Although this feature as such can be derived from page 8, lines 5 to 8 of the application as filed, the appellant argued that its disclosure was restricted to a single layer structure.

2.1.1.1 However, it is clear from the context of the relevant passage, in particular from page 8, lines 27 and 28 of the application as filed, that the preheating step, which is specifically referred to on page 8 at lines 1 to 11, is equally applicable not only to a single layer structure but also to a "multilayer structure". Thus, the disclosure of the preheating step also relates to a multilayer structure of the catalytic active substance layer according to claim 3.

2.1.1.2 Although, according to a further objection of the appellant, the general definition of the "baking deposition method", on page 6, lines 21 to 31 did not refer to the preheating of the carrier, closer inspection of the description shows that this method is further illustrated to include the preheating of the carrier to the claimed temperature as an essential feature (page 8, first paragraph). Consequently, the allegation that this feature is missing from the definition is not supported by the relevant description read in its proper context.

2.1.1.3 Finally, it has been confirmed by all the examples 23 to 38, which are related to a multilayer structure, that the preheating of the carrier within the claimed temperature range is also of critical importance for

this embodiment (page 35, lines 18 to 21).

- 2.1.1.4 Hence, the amendment does not involve the addition of subject matter. Nor, since it involves a narrowing of the relevant definition, does it lead to any broadening of scope.
- 2.1.2 According to the last feature of amended claim 3, the phrase "calcining the inert layer having deposited the slurry or solution thereof" has been added. This feature is supported on page 6, lines 5 and 6 of the application as filed and does not involve the addition of subject matter or any broadening of scope, and indeed no formal objections have been raised by the appellant in this respect.
- 2.2 Consequently, the claimed subject matter of the main request meets the requirements of Article 123(2) and (3) EPC.
- 3. *Insufficiency under Article 100(b) EPC*
- 3.1 According to the appellant's first objection catalyst precursor layers could not be deposited by "mere spraying" (alleiniges Besprühen) the catalyst composition onto the preheated carrier when following the teaching of the claims.
- 3.1.1 The appellant's argument was based on a general statement in the notice of opposition that a catalyst layer could not be obtained by "mere spraying" an aqueous solution of starting compounds on SiC-carrier pellets preheated to 100°C (page 4 and 5 bridging paragraph) and also on a report of a repetition of example 10 of the patent in suit (pages 7 and 8). The

latter report was supplemented in the statement setting out the grounds of appeal by a statement that the reproduction of example 10 produced a catalyst precursor layer only if the carrier pellets were contained in a rotating drum which had been heated at least during the whole period of spraying to the preheating temperature of the carrier (page 1, last but one paragraph). Finally, according to the decision under appeal the appellant (opponent) had evidently argued that if the drum was not heated, no useful catalyst could be obtained (page 6, point 12b) first paragraph).

3.1.1.1 Whilst the preheating temperature in example 10 is 120 to 200°C (page 6, line 46 of the patent in suit) the preheating temperature at "mere spraying" was 100°C. Thus, the above cited tests can only refer to two different experiments. This was not disputed by the appellant at the oral proceedings. Consequently, as no further details are given, it can only be speculated under which circumstances and in what kind of apparatus the "mere spraying" of the first test report on pages 4/5 of the notice of opposition has been effected.

3.1.1.2 In particular, the appellant's "mere spraying" test is severely deficient because it does not give the necessary information by which a deposited layer could "not be formed" by the person skilled in the art. Consequently, this test report does not provide a proper evidential basis for the objection under Article 100(b) EPC.

3.1.1.3 It is in any case perfectly clear from the wording of claims 1 and 3, according to which the inert carrier

is first preheated to a specific temperature of 100 to 250°C and afterwards the slurry or solution is sprayed onto the inert carrier, that the spraying must be effected on an already preheated carrier. It is within the normal understanding of the skilled person to continue the preheating of the carrier as long as the spraying step is not yet finished, i.e. over the whole period of spraying.

This is supported by all the examples of the patent in suit, wherein the carrier resides throughout the whole spraying treatment in an externally heated rotating furnace, and also by the definition of the "baking deposition method" on page 4, lines 20 to 25 of the patent in suit, according to which the slurry or solution is sprayed onto an inert carrier to form a deposited layer. The deposition is "preferably" carried out in a rotary furnace heated to 100 to 250°C. Whilst preheating the inert carrier to the claimed temperature and rotating the rotary furnace the slurry is sprayed onto the inert carrier. Thus, it is evident, that the prevailing preheating conditions should be such that they are continued during the whole spraying.

3.1.2 Quite apart from this, the reference to the results of carrying out example 10 in the statement setting out the grounds of appeal amounts to an admission that a precursor layer can be effectively formed if the deposition step is carried out in a rotating vessel in which the carrier particles had been maintained during the whole spraying to the preheating temperature (page 1, paragraph last but one).

3.1.3 Consequently, the patent in suit as a whole discloses

sufficiently and completely the deposition conditions by which the person skilled in the art can reliably and effectively produce a deposited layer on the preheated carrier.

3.2 The appellant's further objections that claims 1 and 3 did not make reference to specific preheating conditions during the spraying and did not specify the amount of catalytically active substance are not related to an objection under Article 83 EPC for the following reasons:

3.2.1 Whilst the requirement under Article 83 EPC is related to sufficiency of disclosure of the invention in the patent as a whole the requirements of Article 84 EPC concern the claims only and require that the claims shall define the matter for which protection is sought. Furthermore, they shall be clear and concise and be supported by the description. More specifically according to Rule 29(1) EPC the claims shall define the matter for which protection is sought in terms of technical features. Thus, the primary aim of the wording used in a claim must therefore satisfy such requirements having regard to the particular nature of the invention and the purpose of the claims (see G 2/88, OJ 1990, 93, reasons, point 2.5).

3.2.1.1 The provisions under Article 83 EPC (sufficiency) and Article 84 EPC (clarity) must therefore be clearly distinguished from one another, as only Article 83 EPC is related to an opposition ground in the sense of Article 100(b) EPC, whilst Article 84 EPC is not.

3.2.1.2 As long as the contested claim, on its proper interpretation, does not cover embodiments which

cannot be carried out, the question whether more details of the deposition method have to be incorporated into a claim has thus to be answered under Article 84 EPC.

3.2.1.3 Even if objections to claim 1 and 3 under Article 84 EPC were admissible in the present case, it is evident from the description of the patent in suit that the deposited layer is formed in a "rotary furnace" as a "preferred" feature (page 8, lines 3 to 5 of the application as filed) and that the amounts of the catalytically active substance are disclosed to cover "usually" 5 to 100 g which features are thus neither specified as essential nor related to the core of the invention.

3.2.1.4 Consequently, claims 1 and 3 of the main request would also meet the requirements of Article 84 EPC.

3.2.2 In summary, the patent as a whole provides a sufficient disclosure, which enables the person skilled in the art to carry out the claimed baking deposition process successfully, and leads to a catalyst layer suitable for the production of methacrylic acid.

3.3 According to the appellant's further objection, the parameters of claims 2 and 4 were not sufficiently disclosed because the patent in suit did not describe the measuring method by which the parameters of the "active substance layer as such" could be determined.

3.3.1 In support of this objection, the appellant had tried to repeat example 10 of the patent in suit and had argued that from his experiments the results of the

examples of the patent in suit could not be confirmed. These objections are not convincing for the following reasons:

- 3.3.1.1 Whilst the appellant's experiments are carried out at a calcination temperature of 1000°C (page 7, second paragraph of the notice of opposition), in example 10 of the patent in suit the calcination temperature is only 400°C (page 6, line 48). Furthermore, in the description of the patent in suit there is no reference to a calcination temperature as high as 1000°C. Quite to the contrary the highest calcination temperature mentioned in the description is 600°C (page 4, line 27). This highest calcination temperature is also in line with the temperatures cited in the relevant prior art (D1, page 3, lines 15 to 16, 180-600°C; D2, page 6, line 15, 350-450°C; D5 example 1, 400°C).
- 3.3.1.2 Thus, the appellant has not repeated example 10 of the patent in suit but on the contrary has arbitrarily modified example 10 by using a calcination temperature neither covered by the general description of the patent in suit nor envisaged in the relevant cited prior art. Consequently, the appellant's evidential support is severely deficient so that no reasonable conclusions can be drawn from these experimental results as to whether the parameters of claims 2 and 4 have been met or not.
- 3.3.1.3 Furthermore, the appellant did not file any further evidential support from which it could be derived that the skilled person was unable to determine the relevant parameters for the active substance layer as such by taking into account his general technical

knowledge. Consequently, the appellant has not supported his objection, for example by relevant prior art literature, that there may be a problem with the determination of the parameters for the active substance layer as such, let alone established, that it was impossible for the person skilled in the art to measure them.

3.3.1.4 In summary, the appellant's objection amounts to no more than a simple assertion. The onus of proof in this respect lies, however, with the opponent (T 219/83, OJ EPO 1986, 211). This he has failed to discharge.

3.3.2 Quite apart from the above, the patent in suit discloses measuring methods and provides further details of the measuring devices by which the claimed parameters can principally be determined (see page 5, lines 14 to 28 of the impugned patent). As these measuring methods are automatic standard methods for determining catalytic surface properties the skilled person normally will have no problems in carrying out the necessary tests.

3.3.2.1 Even the appellant had no difficulty in determining these parameters on an inert carrier and a catalyst having deposited thereon an active substance layer (pages 8 and 9 of the notice of opposition).

3.3.2.2 Consequently, the board sees no reason why the person skilled in the art should be unable to measure the claimed parameters of the active substance layer with the disclosure given in the patent in suit and his general technical knowledge.

3.3.3 In summary, the requirements of Article 100(b) EPC have been met.

4. *Patent in suit; the technical problem and its solution (main request)*

4.1 The patent in suit is concerned with a catalyst for the production of methacrylic acid composed of an inert carrier and deposited thereon a catalytically active substance layer which is composed of oxides based on molybdenum as main component and is deposited on the carrier by spraying an aqueous slurry at higher temperatures.

Such catalysts are known from D5 which has been discussed in the oral proceedings as the closest prior art document and which according to the decision under appeal was regarded in addition to D1 and D2, as the most "relevant" prior art document.

4.2 D5 discloses inter alia an active catalyst layer for the oxidation of methacrolein based on a general formula $Mo_{12}V_aW_bA_cB_dO_x$ wherein A is Cu and/or Fe, B is Ni, Mn, Sn, Sb, Cr, Ca, Sr, Ba, Mg, Na, K, Rb or P, a = 0.5 to 16, b = 0.1 to 8, c = 0.5 to 6, d = 0 to 3 and x is a number required by the oxidation state of these elements. In particular, the alkali metals and alkaline earth metals and especially P are preferably present in an amount of d = 0.1 to 3 (page 10, lines 7 to 29).

In D5 the catalyst layer is deposited on the carrier by preheating the agitated carrier to below 100°C and spraying an aqueous slurry of the active catalyst material onto the carrier (claim 1). According to this

process, a uniform distribution of an active substance on the carrier particles having a high attrition resistance (Abriebfestigkeit) is obtained (page 8, lines 5 to 13).

In example 1 of D5, a catalyst having a composition $\text{Mo}_{12}\text{V}_3\text{W}_{1,2}\text{Cu}_{2,2}\text{O}_x$ is prepared, calcined, slurried in water and deposited on alumina carrier bullets by spraying the slurry onto the carrier in a rotating drum, which is held at a temperature of 36-40°C to produce catalyst A. Catalyst A is used for the oxidation of acrolein and tested to have an attrition resistance of less than 0.1% by weight, based on the active substance (page 18, lines 5 to 12).

- 4.3 Compared to this state of the art, the technical problem may be seen in providing a catalyst which has an adequate attrition resistance whilst showing a high selectivity and high yield in the production of methacrylic acid (page 3, lines 5 to 15 of the patent in suit).
- 4.4 The solution proposed according to claim 1 of the main request is to form the catalytically active substance layer by preheating the inert carrier to 100°C to 250°C and to choose as active substance layer a composition of oxides represented by formula (I) recited in claim 1.
- 4.4.1 The solution according to claim 3 of the main request is identical to claim 1 except that the deposition method is adapted to provide a multilayer structure consisting of at least two layers having different layers.

4.5 As shown by the examples of the patent in suit the claimed baking deposition method results in an active substance layer having a higher methacrolein conversion and selectivity compared to a catalyst which has been prepared by an immersion process (tables 1 to 9). It has in any case not been disputed that the catalyst compositions according to the patent in suit have satisfactorily high levels of selectivity and yield in the production of methacrylic acid.

4.5.1 Furthermore, according to the uncontested experimental report submitted on 12 August 1993 (D6), a catalyst I-2 according to the patent in suit has been prepared by using two different preheating temperatures of the carrier (150 and 230°C respectively; examples A and B) and a comparative catalyst has been prepared under identical conditions except of the preheating temperature being 50-70°C (comparative example A). According to these experimental results, determined under identical test conditions, an improved attrition loss of the catalyst I-2 (7.6 and 3.1%) compared to comparative catalyst A (24.8%; table 10) is obtained.

4.5.2 The question whether the test report according to D6 show an improved attrition loss over that of the catalysts according to D5 is assessed as follows:

4.5.2.1 Although there are certain differences in the measuring conditions used to determine the attrition loss in D5 compared with those applied in D6, specifically in that instead of 160 g of catalyst sample 50 g are used and in that the rotation rate is 35 rpm instead of 30 rpm, this is only a slight modification in the test conditions and would be no reason to exclude a qualitative comparison of the test

results with each other. In this connection, the attrition loss of 0.1% found in example 1 of D5 represents, on its own, a favourable attrition resistance performance.

4.5.2.2 However, D6 presents a comparative test with a newly prepared variant of the closest state of the art making identical the features common with the claimed subject matter (catalyst composition) in order to have a variant lying closer to the claimed subject matter so that the advantageous effect attributable to the distinguishing features of the invention (preheating temperature of the carrier) is thereby more clearly demonstrated. An appellant or a patentee has the option of discharging his onus of proof by voluntarily providing such closer comparison (T 35/85 of 16 December 1986, head note, not published in OJ, EPO).

4.5.2.3 As the only variation in comparative example A of D6 is the preheating temperature, the comparative example is thus closer to the patent in suit invention than any example shown in D5. Consequently, the respondent's experiments in D6 show that the relevant technical effect has its origin in the distinguishing preheating temperature, so that they are also in line with the requirement referred to in the decision T 197/86 (OJ EPO 1989, 371).

4.5.2.4 In summary, a catalyst according to the patent in suit has an attrition resistance which, whilst being qualitatively comparable with that achieved according to the most relevant example of D5, is nearly a factor of ten better (in the case of example B of D6) than a catalyst lying closer to the claimed subject matter

than the relevant example of D5, and indeed differing only by the single feature of the preheating temperature.

4.5.2.5 Whilst this constellation of results may at first sight seem somewhat paradoxical, there is no reason for regarding it as inconsistent, since the catalyst composition used according to example 1 of D5 is rather different from the catalyst composition according to comparative example A of D6 (according to the patent in suit). Furthermore, whilst in example 1 of D5 the calcination of the the catalyst components is effected before spraying and depositing the catalyst composition onto the carrier, according to claim 1 the slurry of the elemental components of the oxides is first deposited on the inert carrier and afterwards calcined having the slurry deposited thereon.

4.5.2.6 In particular, the catalyst composition of example 1 of D5 ($\text{Mo}_{12}\text{V}_3\text{W}_{1,2}\text{Cu}_{2,2}\text{O}_x$) does not comprise phosphorus in an atomic ratio of 0.5 to 4 and alkali in an atomic ratio of 0.01 to 4. Since, however, both catalysts fall under the general formula given on page 10 of D5 (point 4.2 above) it is evident that the relevant attrition performance of the various catalysts covered by the disclosure of D5 is far from being on the same level. Furthermore, in D5 the relevant attrition resistance is not related to the time point when deposition and calcination is effected, since the calcination can also be carried out after the deposition step (D5, page 11, lines 28 to 31). On the contrary, it is evident that the attrition resistance of a catalyst composition according to claim 1 of the patent in suit, if preheated according to the

procedure taught in D5, will become substantially worse than what would be expected from a generalisation of the relevant example of D5.

- 4.5.2.7 Consequently, a closer examination of D5 and the results of D6 indicates a special situation, since it demonstrates a relationship of the claimed subject matter to the closest state of the art, which is not immediately apparent from an isolated direct comparison of the two. In contrast a rather more complete picture is shown by a closer comparison represented by D6.

According to this picture, the attrition resistance performance of the catalysts according to the patent in suit fulfils the requirements of the technical problem in relation to the best performance exemplified in D5, but is considerably better than the overall performance of non-exemplified variants falling within the general disclosure of D5.

Consequently, the subject matter claimed in the patent in suit thus objectively seen in relation to this deteriorated level of attrition resistance represents a substantial improvement in that property.

- 4.5.3 In view of the above reasons, it is credible to the board that the measures defined in claim 1 provide an effective solution of the technical problem. By the same token, this applies to independent claim 3 as well.

5. *Novelty (main request)*

The finding in the decision under appeal, that the

claimed subject matter was novel, has also not been contested by the appellant, and the board sees no reason to take a different view. Consequently, the claimed subject matter is held to be novel.

6. *Inventive step (main request)*

6.1 In order to assess inventive step, it is an established practice of the boards of appeal to apply the problem and solution approach (Case Law of the Boards of Appeal, third edition 1998; I. D. 2). In this respect only document D5 has been advanced in the oral proceedings as the "closest" prior art document.

6.2 It is necessary to consider whether the skilled person, starting from catalysts for the production of methacrylic acid according to D5 and faced with the problem of providing catalysts having an adequate attrition resistance would have expected this result to be achieved (i) by modifying the catalyst composition to reduce the amount of V and/or W and providing instead relevant atomic quantities of P and alkali metal or alkaline earth metal or thallium corresponding to formula (I) of the patent in suit, (ii) by increasing the preheating temperature of the inert carrier to 100 to 250 °C when depositing the active substance layer thereon and (iii) by calcining the inert carrier having deposited the slurry thereon instead of calcining the catalyst components first before depositing the catalyst composition onto the carrier.

6.2.1 There is no incentive to make modification (ii) in D5 itself, since only preheating temperatures below 100°C are taught and, furthermore, a preheating temperature

below 100°C is presented as an essential feature (compare claim 1).

6.2.2 The situation is not quite the same for modifications (i) and (iii). Whilst there is no direct hint to a catalyst composition corresponding to formula I of the patent in suit, nevertheless it could be argued that measure (i) was at least an option open to the skilled reader of D5, to the extent that the general formula on page 10 of that document covers catalysts containing the relevant amounts of P and alkali/alkali earth metal or thallium as well as permitting lower levels of combined V, W, falling within the said formula I, to be present. Furthermore, it could be argued that measure (iii) is an variant open to the person skilled in the art, as a final calcination step of the components on the carrier is considered in preferred embodiments instead of depositing an already calcined catalyst composition onto the carrier when reading page 11, lines 24-31 in its context.

6.2.2.1 This point of view is, if anything, reinforced by the fact that specific such compositions are known from D1 and that a calcination step after having supported the catalyst composition thereon is described in D2.

6.2.2.2 If the skilled person were, however, on this hypothesis, to attempt modifications (i) and (iii) of D5, the result of such modification would, for the reasons given above in relation to D6, be a substantial deterioration in attrition resistance.

6.2.2.3 In other words, the only relevant modifications of D5 which might arguably be options for the skilled person to make, would be inescapably accompanied by a

conspicuous failure to solve the technical problem. Thus, there would be a strong practical disincentive for the skilled person to effect such modifications.

6.2.2.4 In summary, if the skilled person tried to modify the relevant disclosure of D5 in a direction of the patent in suit, namely by the use of a catalyst composition according to the latter (which is in any case also known from D1) and by using a modified calcination procedure (described in D5 itself and known from D2) whilst maintaining the process conditions already taught for obtaining attrition resistance (Abriebfestigkeit) in D5, the result would be a substantially worse attrition resistance than that expected from D5 above. Thus, in passing from the closest state of the art to the claimed subject matter an unexpected deterioration of the desired effect occurs.

6.2.2.5 Thus, there is no incentive in D5 to make other modifications (i) or (ii) or (iii), in particular in combination thereof.

6.3 Although in D1 and D2 catalysts are known which have a composition according to the specified formula (I) as claimed (D1, claim 1, page 4, lines 5 to 16, example 4; D2, claims 1 to 6, page 6, lines 22 to 37, example 1, table 1), the deposition of the catalyst composition is effected by spreading a powdered catalyst composition onto the wet carrier. There is, however, no hint to preheat the carrier to the specified temperature as claimed during spraying a slurry or solution of the catalyst composition.

6.3.1 Thus, as pointed out above, even if the skilled person

had modified the teaching of D5 by using a catalyst composition according to D1 or D2 and by effecting a modified deposition and calcination procedure indicated in D2 he would have found, that the attrition resistance would be extremely worse (comparative example A, D6). Consequently, the skilled person would not have expected an effective solution of the stated problem by using the claimed higher preheating temperature.

6.3.2 In summary, the patent in suit represents a relevant combination in terms both of appreciation of a previously unsuspected problem of deteriorated attrition resistance within the scope of D5, and the provision of an effective solution for it, not suggested by D5 or any of the other documents cited. In this specific case it is not crucial whether the quantitative level of attrition resistance achieved according to the patent in suit is greater, the same, or even somewhat less than that achieved according to the relevant example of D5. Of significance is that the claimed solution represents a major improvement over that which would otherwise have been obtained in modifying D5, in the light, for example, of D1 or D2, in the direction of the claimed subject matter. In other words, an inventive step must be recognized in respect of the contribution represented by the claimed solution to the technical problem.

6.4 The appellant's objection, that an inventive step cannot be seen because no active substance layer is formed by "mere spraying" onto the preheated carrier, has no evidential basis (point 3.1.1.2). Furthermore, quite to the contrary an active substance layer having improved attrition loss is formed when applying the

teaching of the patent in suit (points 3.1.1 to 3.1.1.3, 4.5.1 and 4.5.2.2 above).

6.5 Consequently, the solution of the technical problem does not arise from the state of the art in an obvious manner.

6.6 The appellant's further objection to the decision under appeal, that a pretended prejudice has been established, can be left open for the following reasons:

6.6.1 It is the established case law of the boards of appeal that a mere investigation for indications (secondary indicia) of inventive step is no substitute for the technical assessment of the invention vis-à-vis the state of the art pursuant to Article 56 (Case Law of the Boards of Appeal, *supra*, I. D. 7.1). Thus, secondary indicia like a prejudice in the art are merely "auxiliary considerations" in the assessment of inventive step (T 1072/92 of 28 June 1994 and T 351/93 of 1 March 1995, neither not published in OJ EPO; Case Law of the Boards of Appeal, *supra*).

6.6.2 As the assessment of inventive step under the problem solution approach has already come to the conclusion that the subject matter of the patent in suit is not obvious over the cited prior art (point 6.3.2), it is not necessary to evaluate whether or not additionally a prejudice existed in the technical field concerned.

6.7 Consequently, the subject matter of claim 1 involves an inventive step.

6.8 As the relevant features according to claim 3 are

identical to claim 1, it follows from the above that the subject matter of claim 3 is based on an inventive step as well, and, by the same token, that of dependent claims 2 and 4 also.

6.9 Thus, the grounds of opposition do not prejudice the maintenance of the patent in amended form on the basis of the main request.

7. *Reimbursement of the appeal fee*

7.1 According to Rule 67 EPC the reimbursement of appeal fees shall be ordered in the event ... where the Board of Appeal deems an appeal to be allowable, if such reimbursement is equitable by reason of a substantial procedural violation.

7.2 Although the appeal is successful in a partial aspect, the further prerequisite of Rule 67 EPC that a "substantial procedural violation" has occurred, is not fulfilled for the following reasons.

7.2.1 The appellant's first objection relates to an alleged contradiction in the reasoning of the decision under appeal (point 12b); page 6). This objection is based on the reproduction of a "variant" of example 10 of the patent in suit, according to which the carrier particles contained in a rotating drum are "not" maintained at least during the whole period of spraying at the preheating temperature (compare point 3.1.1 above). Contrary to the appellant's allegation, the decision under appeal did not accept that this variant of example 10 was covered by the patent in suit, because the deposition conditions did not follow the teaching of the patent in suit as a

whole (page 7, paragraphs 1 to 3). This reasoning of the opposition division is in line with the reasons given by the board.

- 7.2.1.1 Thus, the appellant's objection is based on an incorrect assumption that the opposition division accepted the appellant's experimental results as if they were obtained in line with the teaching of the patent in suit. Consequently, there is no contradiction in the decision under appeal in this respect.
- 7.2.2 According to a further objection the decision under appeal was wrong in reasoning that the measurements of pore diameter distribution, pore volume and specific surface were not relevant to the question, whether the catalysts could be obtained in the sense of Article 83 EPC and that it was not relevant whether these measurements gave accurate values.
 - 7.2.2.1 As the claimed catalysts are not only sufficiently disclosed in the patent in suit as a whole and can be reliably reproduced but are also characterized by parameters which can be measured by the person skilled in the art (points 3.2.2 and 3.3.2.2 above), the conclusion of the decision under appeal accepting the requirements of Article 83 EPC is correct (points 12a) to 12c)). As this conclusion has been reasoned in detail by the assessment of arguments and evidence on file, on which the parties have had the opportunity to present their comments under Article 113(1) EPC, a substantial "procedural" violation can not be involved.
 - 7.2.2.2 In particular the question, whether a specific

reasoning, objected to in the decision under appeal, is correct or not (pages 7 and 8, point 12 c)), relates to a substantive and not a procedural issue and is thus of no relevance for the reimbursement of the appeal fee (T 367/91 of 14 December 1992, Case Law of the Boards of Appeal, *supra*, VII. D. 15.4.5), dealing with a wrong assessment of prior art and/or the claimed invention; and T 182/92, Case Law of the Boards of Appeal, *supra*, dealing with a wrong conclusion of the first instance regarding the priority document).

- 7.3. As the prerequisites under Rule 67 EPC are not met, the request for reimbursement of the appeal fee must be rejected.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent as amended in the following version:

Claims: claims 1 to 4 submitted with letter dated 14 February 2001,

Description: page 4 submitted with letter dated 14 February 2001;
page 6 submitted during oral proceedings; and

pages 2, 3, 5, 7 to 28 as granted.

3. The request for reimbursement of the appeal fee is rejected.

The Registrar:

The Chairman:

C. Eickhoff

R. Teschemacher