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**D E C I S I O N**  
**of 27 September 2000**

**Case Number:** T 1063/96 - 3.3.1

**Application Number:** 91310444.4

**Publication Number:** 0486268

**IPC:** C07C 39/20

**Language of the proceedings:** EN

**Title of invention:**

A method for preparing 4-hydroxystyrene

**Applicant:**

HOECHST CELANESE CORPORATION

**Opponent:**

-

**Headword:**

4-hydroxystyrene/HOECHST CELANESE CORPORATION

**Relevant legal provisions:**

EPC Art. 123(2), 56

EPC R. 71(2)

**Keyword:**

"Main request - support by the application as filed (no)"

"Auxiliary request - inventive step (yes) - non-obvious alternative"

**Decisions cited:**

G 0003/89, T 0002/81, T 0201/83, T 0194/84, T 0383/88,

T 0288/92, T 0795/92

**Catchword:**

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Case Number: T 1063/96 - 3.3.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.1**  
**of 27 September 2000**

**Appellant:** HOECHST CELANESE CORPORATION  
Route 202-206 North  
Somerville, N.J. 08876 (US)

**Representative:** De Minvielle-Devaux, Ian Benedict Peter  
CARPMAELS & RANSFORD  
43 Bloomsbury Square  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 15 July 1996  
refusing European patent application  
No. 91 310 444.4 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** J. M. Jonk  
**Members:** P. F. Ranguis  
S. C. Perryman

## Summary of Facts and Submissions

I. The present appeal lies from the decision of the Examining Division posted on 15 July 1996 refusing European patent application No. 91 310 444.4 (publication No. 0 486 268).

II. The application was originally filed with claims 1, 5 and 7 reading:

"1. A method for preparing 4-hydroxystyrene, which comprises:

reacting 4-acetoxystyrene with a suitable alcohol in the presence of a catalytic amount of a suitable base to form the 4-hydroxystyrene.

5. The method as defined in any preceding claim wherein said suitable base is selected from the group consisting of potassium hydroxide, sodium hydroxide,  $K_2CO_3$ , triethylamine, trimethylamine,  $KOC(=O)-CH_3$ ,  $NaOCH_3$ ,  $KOCH_3$ , tripropylamine, potassium-tertiary-butoxide, and any suitable mixture of the foregoing.

7. The method as defined in any preceding claim wherein said catalytic amount is from about 1.5 molar percent to about 3.6 molar percent based upon the concentration of said base 4-acetoxystyrene.

III. The decision of the Examining Division was based on the text of the description as amended during the examining proceedings and on claims 1 to 9 as filed on 4 April 1995. Claims 1 and 4 of this set of claims read as follows:

"1. A method for preparing 4-hydroxystyrene, which

comprises reacting 4-acetoxystyrene in the presence of a base to form the 4-hydroxystyrene, characterised in that the 4-acetoxystyrene is reacted with an alcohol having the formula ROH, wherein R is alkyl having from 1 to 6 carbon atoms, the base being selected from metal hydroxides, alkali metal alkoxides, potassium carbonate, alkali metal organic acid salts, amines and mixtures thereof, and the base being present in an amount of 0.5 to 3.6 mole percent relative to the 4-acetoxystyrene.

4. The method as defined in any preceding claim wherein said base is selected from the group consisting of potassium hydroxide, sodium hydroxide,  $K_2CO_3$ , triethylamine, trimethylamine,  $KOC(=O)-CH_3$ ,  $NaOCH_3$ ,  $KOCH_3$ , tripropylamine, pyridine, potassium-tertiary-butoxide, and any suitable mixture of the foregoing."

IV. The reasons for the decision were that the application (description and claim 4) had been amended in such a way that it did not comply with the requirements of Article 123(2) EPC and that the claims 1 to 9 did not meet the requirements of Article 56 EPC in view of the following documents:

(2) Houben-Weyl, "Methoden der Organischen Chemie", 4th ed., Vol. VI, Part 1c, pages 438-439, (1976)

(3) B.B Corson et al. in Journal of Organic Chemistry, Vol. 23, No. 4, pages 544 to 549 (1958).

V. In its decision the Examining Division found, in particular, that the introduction of pyridine in claim 4 extended beyond the content of the application as filed, since the use of the pyridine described in

example No. 9 was directly connected with the specific process conditions of this example. Concerning inventive step, the Examining Division held that the person skilled in the art knew from document (3) that the "sensitive" p-hydroxystyrene could be obtained quantitatively from the aqueous hydrolysis of p-acetoxystyrene in the presence of potassium hydroxide. The person skilled in the art could derive from document (2) that phenols were easily obtained by the transesterification of "sensitive" acetylated phenols in methanol with a base selected from alkali metal carbonate or alkali metal acetate. It was, therefore, obvious that sensitive phenols (like p-hydroxystyrene) could be obtained with good yields by transesterification of acetylated phenols in an alcohol like methanol and in the presence of such a base. In the selection of a suitable amount of base, no inventive activity could be seen because an excess of base was not required in the transesterification embodiment taught in document (3). The Examining Division also denied that the claimed subject-matter could be seen as an improved process for the preparation of p-hydroxystyrene given that the said product is obtained quantitatively in both document (2) and (3).

VI. Against the two grounds of rejection (see point IV above) relied upon by the Examining Decision the Appellant submitted in writing the following arguments.

Regarding the allowability of the amendments (Article 123(2) EPC), he argued that the introduction of pyridine in the description and in claim 4 was allowable on the basis of the disclosure in Example No. 9 since:

(i) Among the suitable bases, the application as filed cited a nitrogen base. Pyridine was a well known amine as confirmed by the following documents submitted with the Statements of Grounds of Appeal:

(4) Organic Chemistry, 2nd ed, (1966), page 718, R. T. Morrison and R. N. Boyd, published by Allyn and Bacon, Inc., Boston,

(5) Organic Chemistry, 2nd ed, (1964), pages 64 to 67, D. J. Cram and G.S. Hammond, published by McGraw-Hill Book Company, Inc. and Kogakusha Company Ltd,

(6) Organic Chemistry (1984), page 923, J. McMurry, published by Brooks/Cole Publishing Company.

It followed that the person skilled in the art having recognised pyridine as an amine (and also as a nitrogen base), would have immediately perceived that the pyridine in example No. 9 would function as a suitable base;

(ii) There was no reason to suppose that pyridine could not be used in other embodiments of the present invention;

(iii) The generalisation of a feature from an example is considered to be allowable in accordance with the decision T 201/83 (OJ EPO 1984, 481) provided that the person skilled in the art could have readily recognised this feature as

not so closely associated with the other features of the example as to determine the effect of that embodiment of the invention as a whole in a unique manner and to a significant degree. There is nothing to suggest that the use of pyridine in the example was so closely tied to the other parameters in that example as to give rise to a unique and significant effect;

- (iv) Having regard to the test suggested in T 194/84 (OJ EPO 1990, 59), claim 4 as amended by the addition of pyridine would not be novel compared with the content of the original application, since it would be immediately and unambiguously derivable from the original disclosure, in particular from original Example No. 9, that pyridine is disclosed as a suitable base.

The introduction of "pyridine" in claim 4 and in the description therefore did not contravene the requirements of Article 123(2) EPC.

Together with the Statement of Grounds of Appeal, the Appellant submitted as auxiliary request an amended set of claims. Claim 1 of the auxiliary request differed from Claim 1 according to the main request in that the base was restricted to alkali metal hydroxides and mixtures thereof (former claim 5). Said Claim 1 read as follows:

"1. A method for preparing 4-hydroxystyrene, which comprises reacting 4-acetoxystyrene in the presence of a base to form the 4-hydroxystyrene, characterised in that the 4-acetoxystyrene is reacted with an alcohol having the formula ROH, wherein R is alkyl having from



1 to 6 carbon atoms, the base being selected from alkali metal hydroxides and mixtures thereof, and the base being present in an amount of 0.5 to 3.6 mole percent relative to the 4-acetoxystyrene."

Claims 4 and 5 according to the refused set of claims were dropped. A new claim 4 was added, said claim reading as follows:

"4. The method as defined in claim 1, 2 or 3 wherein the base is potassium hydroxide, sodium hydroxide or a mixture thereof."

Concerning the inventive step of both the main and auxiliary request, the Appellant argued essentially that:

- Neither document (2) or document (3) disclosed a process for preparing 4-hydroxystyrene in which 4-acetoxystyrene was reacted in the presence of a C<sub>1</sub>-C<sub>6</sub> alkanol with a base, the latter being used in an amount of only 0.5 to 3.6 mole percent relative to the 4-acetoxystyrene.
- Furthermore, with regard to document (2), the Examining Division had failed to establish that "sensitive acetylated phenols" encompassed 4-acetoxystyrene and that the use of 0.5 to 3.6 mole percent of base relative to the acetylated phenol was obvious.

VII. The Appellant, having been duly summoned, informed the Board that he would not attend the oral proceedings. They thus took place in the absence of the Appellant (Rule 71(2) EPC).

VIII. The Appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of

as main request the claims and description considered in the decision under appeal, or as auxiliary request with

**Claims:** Claims 1 to 8 filed on 13 November 1996,

**Description:** pages 1 to 3, 6 and 7 as originally filed,  
page 4, as filed on 13 November 1996,  
page 5 as filed with letter of 15 August 1994,  
pages 8 and 9 as filed with letter of 4 April 1995.

### Reasons for the Decision

1. The appeal is admissible.
2. *Main request*
  - 2.1 Compliance with Article 123(2) EPC
    - 2.1.1 In the Board's judgment, the critical point at issue is to decide whether or not the introduction of pyridine in claim 4 and in the description on page 4 meets the requirements of Article 123(2) EPC. This introduction amounts to specifically claiming a process for preparing 4-hydroxystyrene involving the use of 0.5 to 3.6 mole percent of pyridine relative to

the 4-acetoxystyrene. Yet in all the description and claims as originally filed, the only mention of pyridine was to be found in example No. 9 which related to a process for preparing 4-hydroxystyrene involving 102% mole percent of pyridine relative to the 4-acetoxystyrene. This example No. 9 has now indeed been cancelled from the description, presumably because it clearly falls outside the claims now put forward.

2.1.2 Article 123(2) EPC requires that a European patent application (or a European patent) may not be amended in such a way that it contains subject-matter extending beyond the content of the application as filed. The term "content of the application" relates to the parts of a European patent application which determine the disclosure of the invention, namely the description and claims. For assessing whether an amendment complies with Article 123(2) EPC, what matters is what a skilled person would have objectively derived from the description and claims as originally filed (see G 3/89, OJ EPO 1993, 117, points 1.4 and 2 of the reasons for the decision).

2.1.3 Claim 1 as originally filed and the description gave no quantitative limits on the base but merely required "a catalytic amount of a suitable base". Claim 1 now requires that the base:

(a) be selected from metal hydroxides, alkali metal alkoxides, potassium carbonate, alkali metal organic acid salts, amines and mixtures thereof, and

(b) be present in an amount of 0.5 to 3.6 mole

percent relative to the 4-acetoxystyrene.

Dependent Claim 4 further restricts the base to:

- (c) the group consisting of potassium hydroxide, sodium hydroxide,  $K_2CO_3$ , triethylamine, trimethylamine,  $KOC(=O)-CH_3$ ,  $NaOCH_3$ ,  $KOCH_3$ , tripropylamine, pyridine, potassium-tertiary-butoxide, and any suitable mixture of the foregoing.

2.1.4 First, the Board considers that the range 0.5 to 3.6 mole percent of base relative to the 4-acetoxystyrene defined in the claimed subject-matter derives from the combination of the two part-ranges specifically mentioned in the application as filed in relation to e.g. KOH ie. 0.5 mole percent to about 3 mole percent and 1.5 mole percent to about 3.6 mole percent which are found on page 5, lines 8 to 10 and in claim 7 respectively. In the Board's judgment, the broader range now defined would be immediately apparent to the person skilled in the art at least for alkali metal hydroxydes as the end-points of each part-range are specifically named.

2.1.5 However, the question is whether the claim 4 of this request relating to the combination of "pyridine" as a specific technical feature with the range now defined in claim 1, namely "0.5 to 3.6 mole percent of base relative to the 4-acetoxystyrene" meets the requirements of Article 123(2),

2.1.6 The Board observes that it follows from the application as filed that "a suitable base" includes amines, such as trimethylamine and triethylamine,

including a nitrogen base (see page 4, lines 15 to 25).

Moreover, concerning the expression "catalytic amount" it is stated in the application as filed (see page 5, lines 3 to 10):

"This catalytic amount can readily be determined for the suitable alcohol, suitable base, time and temperature selected by one of ordinary skill in the art without an undue amount of experimentation in the light of the disclosure contained herein. Typically, a catalytic amount of a suitable base, e.g. KOH, ranges from a mole percent of the suitable base to Compound II (*4-acetoxystyrene*) of from about 0.5 mole percent to about 3 mole percent." (Italics added)

2.1.7 The Board concurs with the Appellant that pyridine is an amine and therefore falls under the scope of the definition of a suitable base, which - as indicated above - includes an amine. However, this does not mean that each **combination** of any particular amine, such as pyridine used in Example 9, with the now claimed range of 0.5 to 3.6 mole percent of base relative to the 4-acetoxystyrene is clearly and unambiguously derivable ("beyond any doubt") from the application as filed.

2.1.8 In this context, the Board observes that in view of the general teaching in the application as filed concerning the "catalytic amount" (see page 5, lines 3 to 7, cited in point 2.1.6 above), and having regard to the fact that according to the (now deleted) Examples 2, 3, and 5 to 9 of the application as filed amounts of bases well above the now claimed range can

be applied, i.e. amounts between about 7 mole percent (Example 8) to about 102 mole percent (Example 9 relating to pyridine), the skilled person would rather derive from the application as filed that for **each suitable base the catalytic amount will differ.**

2.1.9 Therefore, the Board concludes that the requested amendments involving the introduction into the present application of the specific **combination** of pyridine with the now claimed range of 0.5 to 3.6 mole percent of base relative to the 4-acetoxystyrene are not allowable as not **directly** and **unambiguously** derivable from the application as filed (see also T 383/88 of 1 December 1992, point 2.2.2 of the reasons for the decision and T 795/92 of 23 April 1996, point 2.1 of the reasons for the decision).

2.1.10 The Appellant referred, in support of his arguments that the insertion of "pyridine" in the description and in claim 4 was allowable on the basis of the disclosure in Example 9 (see under point VI above), to the decisions T 201/83 and T 194/84.

In that context, the Board notes that in the decision T 201/83, the new lower limit incorporated in the claimed invention was drawn out of an example which was still **within** the scope of the amended claim. This is certainly not the case here.

Furthermore, regarding the decision T 194/84, the Appellant referred to the so-called "novelty-test". However, in line with numerous decisions of the Boards of Appeal, the Board is of the opinion that this test to the determination of the allowability of the amendments under Article 123(2) EPC is irrelevant,

since it would require the construction of hypothetical questions which is not the task of an appellate body of final jurisdiction to answer (see for instance T 288/92 of 18 November 1993, point 3.2).

- 2.1.11 It follows that the present request contains subject matter which extends beyond the content of the application as filed and does not meet the requirements of Article 123(2) EPC. For this reason the said request is not allowable.

3. *First auxiliary request*

3.1 Compliance with Article 123(2) EPC

3.1.1 Present Claim 1 is supported by (i) Claim 1 as originally filed in combination with the description as originally filed, namely (ii) page 4, line 4 (R is C<sub>1</sub>-C<sub>6</sub> alkyl), (iii) page 4, lines 16 (alkali metal hydroxides) and 24-25 (mixtures thereof), (iv) page 5, lines 7 to 10 and Claim 7 (respectively 0.5 to 3 and 1.5 to 3.6 mole percent of base relative to the acetylated phenol). In particular, the Board does not see any objection against the last feature since the person skilled in the art would have immediately perceived from the two ranges that the end-points i.e. 0.5 and 3.6 define the limits of another embodiment according to the claimed invention. That amendment does not represent, therefore, a new subject matter within the meaning of Article 123(2) (see decision T 02/81, OJ EPO, 1982, 394, point 3 of the reasons).

3.1.2 Present Claims 2 and 3 are supported by Claims 3 and 4 as originally filed. Present Claims 4 and 5 are supported by the description as originally filed page 4, line 17. Present Claim 6 is supported by the description as originally filed page 5, lines 7 to 10. Present Claims 7 and 8 are supported by the Claims 7 and 8 as originally filed.

3.1.3 The present request meets the requirements of Article 123(2).

3.2 Novelty - Article 54(2) EPC

3.2.1 After examination of the cited prior art documents,



the Board has reached the conclusion that the subject-matter as defined in the claims as granted is novel. Since novelty had never been contested by the Examining Division, it is not necessary to give reasons for this finding.

3.3 Inventive step - Article 56 EPC

3.3.1 It remains to be decided whether or not the present request involves an inventive step as required by Article 56 EPC. In accordance with the "problem-solution approach" consistently applied by the Boards of Appeal to assess inventive step on an objective basis, it is necessary to establish the closest prior art which is to be taken as the starting point, to determine in the light thereof the technical problem which the invention addresses, to verify that the technical problem is solved by all the embodiments encompassed within the claimed solution and to examine whether the claimed solution is obvious or not in view of the state of the art.

3.3.2 Closest prior art

3.3.3 The present claimed subject matter relates to a method of preparation of 4-hydroxystyrene, which comprises reacting 4-acetoxystyrene in the presence of a base.

3.3.4 Document (3) relates to the conversion of 4-acetoxystyrene (0.10 mole) to 4-hydroxystyrene, using KOH in excess (0.25 mole), in the presence of water to produce 100% of 4-hydroxystyrene (see page 548, right column, fourth paragraph).

3.3.5 Document (2) is a basic textbook which reports the

same reaction as that of document (3) in referring explicitly to the latter (see page 439, second paragraph).

3.3.6 The documents (2) and (3) aim at the same objective as the claimed invention. In the Board's judgment, the process disclosed in document (3), which process is reported in document (2), represents the prior art closest to the patent in suit and, thus, the starting point in the assessment of inventive step.

3.3.7 Problem to be solved

3.3.8 The next step in assessing inventive step, is to determine the technical problem relative to the closest state of the art which the invention as claimed can be considered as having solved.

3.3.9 In the application as filed, the processes disclosed in document (3) are said to result in poor yields due to a side-polymerisation reaction of 4-acetoxystyrene and/or 4-hydroxystyrene caused by the aqueous saponification conditions employed therein (see page 1, line 25 to page 2, line 14). Therefore, in the Appellants's opinion, the problem to be solved is to provide a method whereby ready polymerisation of the 4-acetoxystyrene and/or the 4-hydroxystyrene in the formation of 4-hydroxystyrene is avoided (see page 2, lines 20-23). However, this assertion is in contradiction with the reported facts. The yield obtained in the process disclosed in document (3) is actually stated as 100%.

3.3.10 Therefore, the Board is not convinced that the claimed invention necessarily provides any advantage over the

closest prior art. The problem to be solved can only be seen in the provision of an alternative process for preparing 4-hydroxystyrene.

3.3.11 Solution to this problem

3.3.12 The solution to the technical problem underlying the application in suit in its present scope is set out in claim 1 (see point VI above).

3.3.13 In view of the disclosure of examples Nos. 1 and 4 of the application as originally filed (now examples Nos. 1 and 2 of the amended version of the description submitted with the auxiliary request), the Board is satisfied that the claimed subject matter represents a solution to the problem as defined in point 3.3.10.

3.3.14 Assessment of inventive step

3.3.15 It remains to be decided whether or not the proposed solution to the problem underlying the claimed subject matter of the auxiliary request is obvious in view of the cited prior art. In particular, the question is whether it would have been obvious for the person skilled in the art to replace the conditions of reaction disclosed in document (3) (aqueous conditions and 250 mole percent of KOH relative to the 4-acetoxystyrene) by the features as defined in the claimed subject-matter (0.5 to 3.6 mole percent of alkali metal hydroxide relative to the 4-acetoxystyrene in an alcoholic medium).

3.3.16 In addition to the reference to the process disclosed in document (3), discussed above, document (2) reports two other ways to hydrolyse carboxylic acid phenol

esters:

According to the first way:

"The alkaline saponification of carboxylic acid phenol esters runs faster than the acid catalysed hydrolysis. As saponification medium, an aqueous medium, in particular, a methanolic or ethanolic solution of sodium or potassium hydroxide can be used. As the alkali is consumed during the reaction, an excess is usually used".

This process refers to the saponification reaction involving a large amount of base (as in document (3) cited above) and therefore would not lead the person skilled in the art towards the present claimed subject-matter.

According to the second way:

"Sensitive acetylated phenols are gently split using an alkali metal carbonate or alkali metal acetate in alcohol, and transesterification of phenol esters can be carried out still more gently in absolute methanol with sodium methoxide, in the cold."

Concerning this second way, the Board shares the opinion of the Examining Division as to the fact that 4-acetoxystyrene is a sensitive acetylated phenol due to the presence of the vinyl group. Therefore, this part of document (2) would have been considered by the person skilled in the art to solve the technical problem defined above (see 3.3.10 above). However this way would not have led him towards the present claimed subject-matter due to the fact that no method

involving an alkali metal hydroxide was envisaged.

3.3.17 In summary, document (3) teaches a method for hydrolysing 4-acetoxystyrene in presence of a large molar excess of KOH relative to the acetoxystyrene. Looking for another alternative process, the person skilled in the art would not have found relevant information in document (2) leading him to the claimed process given that document (2) on the one hand merely reports the teaching of document (3) and, on the other hand, reports methods for hydrolysing phenol esters, either involving the use of an excess of KOH (first way) or the use of other bases (second way). It is the Board's conclusion that the combined teachings of documents (2) and (3) do not render obvious the claimed subject-matter.

3.3.18 Thus, it follows from the above considerations, that the subject-matter of claim 1 of the auxiliary request involves an inventive step within the meaning of Article 52(1) and 56 EPC.

3.3.19 The same applies to the dependent Claims 2 to 8 relating to specific embodiments of said Claim 1.

## **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 grant a patent on the basis of the auxiliary

request.

The Registrar

The Chairman:

N. Maslin

J. Jonk