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**D E C I S I O N**  
**of 3 June 2002**

**Case Number:** T 0081/99 - 3.3.1

**Application Number:** 96102816.4

**Publication Number:** 0729940

**IPC:** C07C231/02

**Language of the proceedings:** EN

**Title of invention:**

Process for synthesizing fluorinated nitrile compounds

**Applicant:**

E.I. DU PONT DE NEMOURS AND COMPANY

**Opponent:**

-

**Headword:**

Fluoro-amide/DU PONT DE NEMOURS

**Relevant legal provisions:**

EPC Art. 56, 82, 84, 111(1)

**Keyword:**

"Main request: Claim 1 - unity of invention (yes) - support by the description (yes) - inventive step (yes) - non-obvious solution"

"Refund of additional search fees (yes)"

"Remittal to first instance for further prosecution"

**Decisions cited:**

-

**Catchword:**

-





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Boards of Appeal

Chambres de recours

Case Number: T 0081/99 - 3.3.1

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.1**  
**of 3 June 2002**

**Appellant:**

E.I. DU PONT DE NEMOURS AND COMPANY  
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**Representative:**

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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 21 October 1998  
refusing European patent application  
No. 96 102 816.4 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** A. J. Nuss  
**Members:** P. P. Bracke  
R. T. Menapace

## Summary of facts and submissions

- I. The appeal lies from the Examining Division's decision, dispatched on 21 October 1998, refusing European patent application No. 96 102 816.4, published as EP-A-0 729 940, because the application did not meet the requirements of Article 82 EPC (unity of invention) and the then pending Claim 1 did not meet the requirements of Article 56 EPC (inventive step) and Article 84 EPC (clarity and support by the description).

Claim 1 underlying the contested decision was filed with letter of 23 January 1998 and reads:

"1. In the process for reacting fluoro-ester of the formula  $CF_2=CF-R_f-COOR$ , wherein  $R_f$  is perfluoroalkyl or perfluoroalkoxy containing 2-20 carbon atoms and R is alkyl having 1-6 carbon atoms, with ammonia or aqueous ammonium hydroxide to form fluoro-amide of the formula  $CF_2=CF-R_f-CONH_2$ , characterized by carrying out said reaction without a solvent or in a solvent selected from a hydrogen-containing halocarbon or a solvent containing ether oxygen bonded to perfluoroalkyl."

- II. In particular, the Examining Division was of the opinion that the expression "a solvent containing ether oxygen bonded to perfluoroalkyl" rendered Claim 1 unclear, because such expression also embraced solvents containing an oxygen atom bonded at only one side to perfluoroalkyl, whereas the radical at the other side of oxygen was undetermined and might thus contain oxygen not bonded to perfluoroalkyl. As Claim 1 thus encompassed embodiments that would not lead to improved yields, Claim 1 was not supported by the description

and an inventive step could not be acknowledged.

Finally, as the alleged problem underlying the invention of optimizing the yield had not been solved over the entire scope of Claim 1, the common problem for the various embodiments of Claim 1 was merely to provide a further process without any advantageous effects over the process known from, for example, document (4), US-A-4 138 426. As the problem was not novel, Claim 1 did not have a common novel feature distinguishing the claimed subject-matter from the prior art and the three solutions proposed in Claim 1 related to three processes, which had no common inventive concept, contrary to the requirement of unity of invention.

III. With the statement setting out the grounds of appeal dated 23 December 1998 the Appellant filed a new Claim 1 as a main request and a new Claim 1 as an auxiliary request.

Claim 1 according to the main request reads:

"1. In the process for reacting fluoro-ester of the formula  $CF_2=CF-R_f-COOR$ , wherein  $R_f$  is perfluoroalkyl or perfluoroalkoxy containing 2-20 carbon atoms and R is alkyl having 1-6 carbon atoms, with ammonia or aqueous ammonium hydroxide to form fluoro-amide of the formula  $CF_2=CF-R_f-CONH_2$ , characterized by carrying out said reaction without a solvent or in a solvent selected from a hydrogen-containing halocarbon or **a solvent in which the only oxygen present is ether oxygen bonded to perfluoroalkyl.**" (emphasis added)

The Appellant submitted that embodiments which did not

lead to improved yields were excluded from the wording of Claim 1 according to the main request.

As in the conversion of fluoro-ester into fluoro-amide in diethylether according to document (4) the amide was obtained for only 9% (see example 8), the problem underlying the present invention was to increase the yield of such conversion to as high as at least 70% (see column 3, lines 14 to 18, of the application in suit). As there was no other process disclosed in the prior art solving this problem, the three reaction media defined in Claim 1 solving the problem were not obviously derivable from the prior art and were linked by a common inventive concept.

IV. The Appellant requested

- (a) that unity and patentability of the main request Claim 1 or the auxiliary request Claim 1 be acknowledged,
- (b) that the case be referred back to the Examining Division for further prosecution and
- (c) that the two additional search fees be refunded.

### **Reasons for the decision**

1. The appeal is admissible.
2. *Claim 1 according to the main request*
  - 2.1 Article 123(2) EPC

Claim 1 is supported by the features of Claim 1 as filed, by the disclosure on page 1, line 37 to page 2, line 2 of the application as filed, ie. that the reaction is carried out in the absence of a solvent or in a solvent containing oxygen only as ether oxygen bonded to a perfluoroalkyl group, and by the teaching on page 3, lines 3 to 5, of the application as filed that hydrogen-containing halocarbons are preferred solvents.

## 2.2 Clarity and support by the description

As the wording of Claim 1 no longer contains the expression "a solvent containing ether oxygen bonded to perfluoroalkyl" and as the amended expression "a solvent in which the only oxygen present is ether oxygen bonded to perfluoroalkyl" (see the emphasised part) clearly excludes solvents containing oxygen other than the ether oxygen bonded to a perfluoroalkyl group, the reason for refusing the application, namely that the requirements of Article 84 EPC (clarity and support by the description) were not fulfilled, no longer exists.

## 2.3 Novelty

After examination of the cited prior art documents, the Board has reached the conclusion that the claimed process was not described in any of those documents.

In particular, the claimed process differs from the process described in document (4) by carrying out the reaction without a solvent or in a solvent selected from a hydrogen-containing halocarbon or a solvent containing oxygen only as ether oxygen bonded to perfluoroalkyl.

2.4 Inventive step

2.4.1 In accordance with the "problem-solution approach" applied by the Boards of Appeal to assess inventive step on an objective basis, it is in particular necessary to establish the closest state of the art forming the starting point, to determine in the light thereof the technical problem which the invention addresses and solves, and to examine the obviousness of the claimed solution to this problem in view of the state of the art.

2.4.2 The "closest state of the art" is normally a prior art document disclosing subject-matter aiming at the same objective as the claimed invention and having the most relevant technical features in common.

Since Claim 1 relates to a process of reacting a fluoro-ester of the formula  $CF_2=CF-R_f-COOR$  with ammonia or aqueous ammonium hydroxide to form fluoro-amide of the formula  $CF_2=CF-R_f-CONH_2$  and since document (4) is the only cited prior art document describing not only such reaction, but also specifying the solvent used, only document (4) can serve, as the closest prior art, as a suitable starting point for evaluating the inventive merit of the invention.

In example 8 of document (4) the reaction of EVE [i.e. methyl perfluoro-(5-methyl-4,7-dioxa-8-nonenoate)] with ammonia in ether to form AVE [perfluoro-(5-methyl-4,7-dioxa-8-nonenoyl)amide] is described.

2.4.3 As it is said in the application in suit that in example 8 of document (4) AVE is obtained in only 9% yield (see column 1, lines 35 to 38) and as it is said



in column 2, lines 16 to 18, and column 3, lines 14 to 18, of the application in suit that with the claimed process the yield in the reaction of fluoro-ester with ammonia or with ammonium hydroxide to form fluoro-amide can be greatly improved to at least 70%, starting from the disclosure of document (4) the problem underlying the invention must be seen in providing a process for reacting fluoro-ester with ammonia or with ammonium hydroxide to form fluoro-amide in improved yield.

2.4.4 The application in suit claims to solve this problem by the process defined in Claim 1 (see point III above).

2.4.5 The first point to be considered in assessing inventive step is then whether it has been convincingly shown that by the process according to Claim 1 the problem underlying the patent in suit (see point 2.4.3) has effectively been solved.

It follows from example 1 that AVE can be obtained by reacting EVE with ammonia in 83.5% yield if methylene chloride is used as solvent, whereas AVE is obtained in lower yields when tetrahydrofurane or mixtures of methylene chloride and tetrahydrofurane are used as solvent and from examples 2 and 3 it follows that AVE is obtained in high yields (74% and 84%) when  $\text{CF}_3\text{CHCl}_2$  respectively  $\text{CH}_3\text{CFCl}_2$  is used as solvent whereas a yield of only 4% is obtained when using  $\text{CF}_3\text{CH}_2\text{OH}$  as solvent. From example 6 it further follows that AVE is obtained in 84.8% yield when the reaction of EVE with ammonia is conducted in the absence of a solvent.

From example 6 it further follows that AVE is obtained in 84.8% yield when the reaction of EVE with ammonia is conducted in the absence of a solvent

Moreover, from examples 4 and 5 it follows that AVE is obtained in 81% and 82.3% yield when reacting EVE with aqueous ammonium hydroxide in  $\text{CF}_3\text{CF}_2\text{CF}_2\text{-O-CFH-CF}_3$  respectively methylene chloride as solvent.

Considering those data, in the Board's assessment a credible case has been put forward that with the three variants according to Claim 1 the problem underlying the invention (see point 2.4.3) has effectively been solved.

2.4.6 Therefore, it remains to be decided, whether in the light of the teachings of the cited documents a skilled person seeking to solve the above-mentioned problem would have arrived at the claimed compounds in an obvious way.

The relevant question in assessing inventive step is whether it was obvious, starting from the teaching of document (4), to try to improve the yield of the reaction by way of what is proposed in Claim 1.

Since in document (4) only diethylether has been mentioned as possible solvent for reacting EVE with ammonia to obtain AVE and in none of the other cited prior art documents the influence of the solvent on the yield of the reaction of a fluoro-ester with ammonia or with ammonium hydroxide to form fluoro-amide has been mentioned, Claim 1 was not obviously derivable from the teachings of the available prior art.

2.4.7 Unity of invention

According to Article 82 EPC in conjunction with Rule 30(1) EPC the requirement of unity of invention is

only fulfilled if a group of inventions is so linked as to form a single **general inventive concept**, ie if there is a technical relationship among the inventions involving one or more of the same or corresponding technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

By replacing the expression "a solvent containing ether oxygen bonded to perfluoroalkyl" by the expression "a solvent containing oxygen only as ether oxygen bonded to perfluoroalkyl" (see the emphasised part of Claim 1) the reason given in the impugned decision for not recognising that the problem underlying the invention is an improved yield of the conversion of  $CF_2=CF-R_f-COOR$  into  $CF_2=CF-R_f-CONH_2$ , no longer exists. As the Board accepts that with the three variants according to Claim 1 defining the reaction medium the problem underlying the invention, namely the provision of a process for reacting fluoro-ester with ammonia or with ammonium hydroxide to form fluoro-amide **in improved yield**, has been solved (see point 2.4.5 above), a technical relation exists among the inventions involving the technical features that define a contribution to the state of the art, and the three process variants are thus based on a single general inventive concept.

The Examining Division took the view that optimisation of the yield of a chemical reaction is such an obvious and general goal which can be achieved in so many unrelated ways, that it cannot serve as a common link or concept within the meaning of Article 82 EPC.

In the present case, however, it is exactly the finding

that the nature of the reaction medium influences the yield, namely that by conducting the reaction without a solvent or in a solvent selected from a hydrogen-containing halocarbon or a solvent containing oxygen only as ether oxygen bonded to perfluoroalkyl the yield is improved, which forms the common link between the three alternatives claimed. As neither document (4) nor any of the other prior art documents mentioned in the search report gives any information how the yield of the reaction of fluoro-ester with ammonia or with ammonium hydroxide to form fluoro-amide could be improved, let alone that the nature of the solvent would have any influence upon the yield, it is the improvement of the yield of fluoroamide which brings about the contribution which each of the claimed inventions makes over the prior art (see point 2.4.5 above) and which therefore forms a single general inventive concept.

3. *Remittal*

All reasons given by the Examining Division's decision for the refusal of the application concern the subject-matter claimed in Claim 1; the contested decision is completely silent about the patentability of the still pending independent Claim 11 as filed, which concerns a process for reacting fluoro-amide of formula  $\text{CF}_2=\text{CF}-\text{R}_f-\text{CONH}_2$  to form a fluoro-nitrile of formula  $\text{CF}_2=\text{CF}-\text{R}_f-\text{CN}$ .

Having regard to the fact that the function of the Boards of Appeal is primarily to give a judicial decision upon the correctness of the earlier decision taken by the first instance and in order to give the Appellant the possibility of having his case examined and decided by two instances, the Board exercises its

discretionary power under Article 111(1) EPC and remits the case to the Examining Division for further prosecution.

**Order**

**For these reasons it is decided that:**

1. The decision is set aside;
2. the two additional search fees are to be refunded; and
3. the case is referred back to the Examining Division for further prosecution.

The Registrar:

The Chairman:

N. Maslin

A. Nuss