

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 11 January 2022**

**Case Number:** T 0024/18 - 3.3.06

**Application Number:** 07796388.2

**Publication Number:** 2043979

**IPC:** B01J37/26, B01J21/04,  
B01J27/125, C07C17/386,  
C07C21/18, C07C17/25

**Language of the proceedings:** EN

**Title of invention:**  
TETRAFLUOROPROPENE PRODUCTION PROCESSES

**Patent Proprietor:**  
The Chemours Company FC, LLC

**Opponents:**  
ARKEMA FRANCE  
Mexichem Fluor S.A. de C.V.  
Daikin Industries, Ltd.

**Headword:**  
Tetrafluoropropene/Chemours

**Relevant legal provisions:**  
RPBA 2020 Art. 13(2)  
EPC Art. 54, 56, 83, 123(2)

**Keyword:**

Amendment after summons - exceptional circumstances (no)  
Sufficiency of disclosure - Explicitly claimed non-working  
embodiment (No) - auxiliary request (yes)  
Amendments - allowable (yes)  
Novelty - auxiliary request (yes)  
Inventive step - auxiliary request (yes)

**Decisions cited:**

T 0012/81, T 0515/00, G 0001/03, T 0601/05, T 0519/07

**Catchword:**



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 0024/18 - 3.3.06

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.06**  
**of 11 January 2022**

**Appellant:** The Chemours Company FC, LLC  
(Patent Proprietor) 1007 Market Street  
Wilmington DE 19801 (US)

**Representative:** Heinemann, Monica  
Abitz & Partner  
Patentanwälte mbB  
Arabellastraße 17  
81925 München (DE)

**Appellant:** ARKEMA FRANCE  
(Opponent 1) Département Propriété Industrielle  
420, rue d'Estienne d'Orves  
92700 Colombes (FR)

**Representative:** Arkema Patent  
Arkema France  
DRD-DPI  
420, rue d'Estienne d'Orves  
92705 Colombes Cedex (FR)

**Appellant:** Daikin Industries, Ltd.  
(Opponent 3) Umeda Center Bldg.  
2-4-12, Nakazaki-Nishi  
Kita-ku  
Osaka 530-8323 (JP)

**Representative:** Hoffmann Eitle  
Patent- und Rechtsanwälte PartmbB  
Arabellastraße 30  
81925 München (DE)

**Party as of right:** Mexichem Fluor S.A. de C.V.  
(Opponent 2) Eje 106 (sin número)  
Zona Industrial  
C.P. 78395  
San Luis Potosi, S.L.P. (MX)

**Representative:** Potter Clarkson  
The Belgrave Centre  
Talbot Street  
Nottingham NG1 5GG (GB)

**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
8 November 2017 to maintain European Patent  
No. 2043979 in amended form.

**Composition of the Board:**

**Chairman** J.-M. Schwaller  
**Members:** S. Arrojo  
R. Cramer

## Summary of Facts and Submissions

- I. Three appeals were filed by the proprietor and opponents 1 and 3 against the decision of the opposition division to maintain European patent No. 2 043 979 on the basis of auxiliary request 1 filed during the oral proceedings on 27 September 2017.
- II. In the present decision, the following nomenclature will be used:
- **245eb** = 1,1,1,2,3 pentafluoropropane
  - **245fa** = 1,1,1,3,3 pentafluoropropane
  - **245cb** = 1,1,1,2,2 pentafluoropropane
  - **1234ze** = 1,3,3,3 tetrafluoropropene
  - **1234yf** = 2,3,3,3 tetrafluoropropene
- III. In its statement of grounds of appeal, the proprietor contested the above decision and requested to maintain the patent as granted (main request) or, alternatively, on the basis of one of the auxiliary requests 1 to 5 filed therewith.
- IV. With their statements of grounds of appeal, opponents 1 and 3 requested to revoke the patent in its entirety, arguing that the claims as upheld by the opposition division did not meet the requirements of Articles 83, 123(2), 54 and 56 EPC. In particular, they argued that said claims were not novel in view of D2 (US 2006/0106263 A1), D5 (WO 2007/117391 A1), D6 (WO 2007/056194 A1) or D7 (WO 2008/057794 A1), and/or that they were obvious in view of D2 combined with either D16 (WO 2005/108334 A1) or D21 (M. Hudlicky, "*Chemistry of organic fluorine compounds*", 2nd edition, 1992). Additionally, opponent 1 filed new documents D28 to D31.

V. With its reply dated 25 July 2018, the proprietor requested to dismiss the appeals from the opponents and submitted auxiliary requests 5b and 6 to 11, with auxiliary request 6 corresponding to the one upheld by the opposition division. The proprietor also requested not to admit into the appeal proceedings documents D28 to D31 as well as D24 (US 2996555), D25 (US 5945573), D26 (US 6031141) and D27 (US 6093859) filed during the first instance proceedings.

VI. **Claim 1 as granted** (main request) reads:

*"1. A process for the manufacture of 2,3,3,3-tetrafluoropropene and 1,3,3,3-tetrafluoropropene comprising:*

*(a) dehydrofluorinating 1,1,1,2,3-pentafluoropropane in the presence of a dehydrofluorination catalyst to produce a product mixture comprising 2,3,3,3-tetrafluoropropene and 1,3,3,3-tetrafluoropropene; and*  
*(b) recovering said 2,3,3,3-tetrafluoropropene and 1,3,3,3-tetrafluoropropene from the product mixture produced in (a)"*

**Claim 1 of auxiliary request 11** corresponds to claim 1 as granted, with the additional features *"... wherein the catalyst is selected from the group consisting of fluorided alumina, aluminum fluoride and mixtures thereof, and wherein said dehydrofluorination reaction is conducted at a temperature of from 300°C to 450°C."*

VII. With their replies to the proprietor's appeal, the opponents argued that auxiliary requests 1 to 5 were insufficiently disclosed and not patentable. Additionally, auxiliary requests 1 and 2 should not be admitted because they corresponded to requests which had been withdrawn during first instance proceedings.

VIII. At the oral proceedings, which took place on 11 January 2022, the discussion focused on the allowability of the main request and auxiliary requests 1 to 10 under Articles 54 and 83 EPC and of auxiliary request 11 under Articles 83, 54 and 56 EPC. The proprietor submitted two further auxiliary requests (designated 2a and 2b) which were not admitted by the board. Before closing the debate, the parties confirmed their final requests to be as follows:

The proprietor requested to dismiss the appeal and to maintain the patent as granted (main request), or auxiliary, to maintain the patent on the basis of one of auxiliary requests 1 to 5 filed with its statement of grounds of appeal on 19 March 2018, or of auxiliary requests 2a or 2b filed during the oral proceedings on 11 January 2022, or of one of auxiliary requests 5b and 6-11 filed with its reply on 25 July 2018.

The opponents requested to set aside the decision under appeal and to revoke the patent in its entirety.

### **Reasons for the Decision**

#### 1. Main request - Article 83 EPC

The invention as granted is not considered to be sufficiently disclosed for the following reasons:

- 1.1 Claim 1 as granted concerns the dehydrofluorination of 245eb in the presence of a catalyst to form 1234yf and 1234ze.
- 1.2 The opponents argued that claim 1 was defined in terms of a result to be achieved (i.e. obtaining the reaction products 1234yf and 1234ze) or in the form of a reach-

through claim. Since the claims defined the reaction conditions in such broad terms, and in view of the fact that the patent itself admitted (1st test in example 1) that the reaction products were not detected at 200°C, the invention could only be carried out by implementing an extensive research program which would impose an undue burden on the skilled person.

- 1.3 The proprietor argued that the breadth of the claim did not justify an objection of insufficiency of disclosure, because there was enough information in the patent to carry out the invention. The determination of the reaction parameters represented a trivial consideration for a person skilled in the art, and in any case, the patent included several tests in example 1 with detailed information on the required conditions to successfully obtain the reaction products 1234yf and 1234ze. It was also apparent in view of the test reports submitted by the opponents, including several examples of dehydrofluorination processes according to the invention, that the reaction defined in claim 1 could be reproduced without undue burden.
- 1.4 In its preliminary opinion, the board indicated that it tended to agree with the proprietor that the breadth of claim 1 as granted did not justify as such an objection of insufficiency of disclosure.
- 1.5 The board subsequently changed its opinion because while it is true that the omission of the reaction conditions in claim 1 would not prevent the skilled person from retrieving the missing information from the specification, there are direct indications in the dependent claims to carry out the process under conditions which the patent itself identifies as a non-working embodiment. In particular, dependent claim 8



explicitly defines a reaction "*conducted at a temperature of from 200°C to 500°C*" and therefore includes an embodiment at 200°C, which according to the patent itself constitutes a non-working embodiment, as the dehydrofluorination reaction of 245eb conducted at 200°C did not lead to the formation of detectable amounts of 1234yf or 1234ze (table 1 of example 1).

1.6 The proprietor admitted that there was no information in the patent (or in any of the tests submitted by the opponents) as to how the dehydrofluorination reaction of the invention could be successfully carried out at 200°C, but argued that, according to established case law, an invention encompassing non-working embodiments was sufficiently disclosed if the patent provided guidance which enabled the skilled person to identify working embodiments without undue burden. In the present case, a skilled person reading the information in the patent as a whole would readily recognise how to obtain the reaction products defined in claim 1. In particular, when the reaction products were not obtained, this could be easily solved by increasing the reaction temperature and/or the contact time and/or making use of another catalyst and/or modifying the atmosphere (e.g. use of an inert gas) in which the reaction was carried out.

1.7 The board notes that the proprietor's reference to the "established case law" refers to the conclusion in G 1/03 (point 2.5.2), according to which a claim might encompass non-working embodiments and still be allowable as long as the specification "*contains sufficient information on the relevant criteria for finding appropriate alternatives over the claimed range with a reasonable effort*". A similar idea was expressed in more detail in T 0515/00 (point 3) and T 0519/07

(point 6.4) (the latter relating to the same technical field as the present invention), which indicated that the "*breadth of a claim should be assessed in accordance with the principles laid down in the Protocol on the Interpretation of Article 69 of the Convention*", and that "*an invention cannot be considered to be irreproducible merely because a claim encompasses (a) hypothetical embodiment(s) laying outside the breadth of the claim as determined by said Protocol, which embodiment(s) cannot be reproduced*". In practice, this implies that if the invention can be carried out as described in the preferred embodiments or following the guidance in the specification of the patent (i.e. in view of the protocol of Article 69 EPC), a broad claim formally covering non-working embodiments is not to be regarded as insufficiently disclosed as long as these embodiments are not explicitly claimed or derivable from the patent as a whole (i.e. the so-called "hypothetical embodiments").

In the board's view, this case law is however not applicable to the present case because the non-working embodiment is not a "hypothetical embodiment" in the sense of the cited decisions (e.g. an embodiment resulting solely from the omission of the reaction temperature in claim 1), but an explicitly claimed embodiment resulting from the broad range of temperatures defined (200°C to 500°C). Furthermore, the non-working embodiment is also derivable from the patent as a whole, because paragraph [0016] explicitly indicates that the reaction can be carried out at temperatures starting at 200°C, which contradicts the results obtained in the patent itself.

Article 83 EPC requires that the patent application should disclose the invention in a manner sufficiently

clear and complete for it to be carried out by a person skilled in the art, wherein the term "invention" concerns the subject-matter of the claims (see T 601/05, point 33). Thus, in the underlying case the skilled person would be directly prompted by the explicit wording of claims 1 and 8 to carry out the dehydrofluorination reaction at temperatures starting at 200°C. This is however not possible in view of the evidence on file, because according to example 1 of the patent, a temperature of 200°C does not lead to any measurable amount of 1234yf or 1234ze. Furthermore, no evidence has been provided that increasing the contact time or adjusting any other operational parameter would solve this problem, and while the skilled person is aware that the reaction products may be obtained at higher temperatures, this does not answer the relevant question of how the reaction can be successfully performed at the claimed temperature of 200°C.

The board therefore concludes that a skilled person trying to reproduce the reaction of claim 1 at 200°C would either not succeed or would at least require an extensive research program to determine the catalysts and/or conditions required to simultaneously synthesise 1234yf and 1234ze as defined in claim 1. The invention is therefore not sufficiently disclosed to carry it out throughout the entire scope of protection, so the opposition ground under Article 100(b) EPC prejudices the maintenance of the patent as granted.

2. Auxiliary requests 1-5, 5b and 6-10 - Article 83 EPC

2.1 As in the main request, the claims of auxiliary requests 1-5, 5b and 6-10 explicitly define the dehydrofluorination of 245eb to obtain 1234yf and 1234ze at 200°C. Consequently, the objection of

insufficiency of disclosure raised against the main request applies equally to each of these auxiliary requests, which are therefore not allowable under Article 83 EPC.

3. Auxiliary requests 2a and 2b - Admittance

3.1 At the oral proceedings, in response to the board's indication that all the requests on file except for auxiliary request 11 were insufficiently disclosed, the proprietor filed two new auxiliary requests 2a and 2b. Since these requests have been filed at the oral proceedings, their admittance is governed by Article 13(2) RPBA 2020, which indicates that requests shall not be admitted at this late stage unless exceptional circumstances apply.

3.2 The proprietor argued that the late filing of these requests was justified by the surprising change of opinion of the board. While the problem of sufficiency of disclosure associated with the broadness of the claimed reaction conditions (i.e. the reaction temperature) had been present from the beginning of the proceedings, the objections from the opponents in this respect had been vague. Furthermore, the newly filed requests were based on combinations of auxiliary requests on file, so they did not impose any undue burden on the opponents. In particular, the requests were a fair attempt to protect the azeotropic compositions which the board (in its preliminary opinion) had considered to be patentable. The reason for not having filed these requests earlier was that the proprietor did not want to cover all possible permutations of amendments, as this would have led to an excessive number of requests due to the large number of objections raised. Finally, when filing the reply to

the statement of grounds of appeal of the opponents in 2018 it could not be foreseen that such strict new provision as Article 13(2) RPBA 2020 would be applied.

- 3.3 The board cannot follow the proprietor's argumentation because none of the reasons brought forward are considered to justify the presence of "exceptional circumstances" as required by Article 13(2) RPBA 2020. In fact, the circumstances cited by the proprietor appear to describe a fairly normal course of events. In particular, it is common for the parties and the board to go deeper into certain aspects of a given objection during the discussion at the oral proceedings, as this is one of the main purposes of the oral hearing. It is also not uncommon for the board to modify its preliminary opinion in view of the details discussed or the questions raised during the oral proceedings. The allegedly high number of objections is also not a reason to justify the late filing of requests, because such circumstance is by no means exceptional.

With respect to the argument that the patent proprietor could not foresee that Article 13(2) RPBA 2020 would become applicable, the board notes that the RPBA 2020 were published well in advance of their entry into force (OJ EPO 2019, A63), giving parties the opportunity to timely file submissions in order to prevent their admittance being subject to the strict provision of Article 13(2) RPBA 2020.

Finally, the board notes that while it might be argued that the filing of the new requests would not present the opponents with completely new subject-matter, this argument is not relevant when exercising the board's limited discretion under Article 13(2) RPBA 2020.

The board therefore concluded that auxiliary requests 2a and 2b were not to be admitted into the proceedings.

4. Auxiliary request 11 - Articles 83 and 123(2) EPC

The formal requirements under Articles 83 and 123(2) EPC are complied with for the following reasons:

- 4.1 Since claim 1 at issue defines that the reaction is conducted in the presence of a specific type of catalyst and at a temperature of 300°C to 450°C, these conditions being the same as those expressly disclosed in the examples of the contested patent, the objection of sufficiency of disclosure raised against the other requests on file does no longer apply.

The board in particular considers that a skilled person would be capable of reproducing the claimed reaction by simply operating within the defined ranges and with the defined catalyst and, if required, by following the more detailed information in paragraphs [0032], [0033] and [0035] of the patent, which according to table 1 of example 1 would give rise to dehydrofluorination of 245eb to 1234yf and 1235ze as defined in claim 1. The requirements of Article 83 EPC are therefore met.

- 4.2 The subject-matter of claim 1 at issue being based on a combination of claims 1, 2 and 9 as filed, and dependent claims 2 to 10 on claims 3 to 7 and 10 to 13 as filed, the requirements of Article 123(2) EPC are met.

5. Auxiliary request 11 - Entitlement to priority

- 5.1 The opponents argued that documents D1 (priority document of D3 (WO 2007/019355 A1)), D2 and D23

(priority document of D5), all filed before the priority date of the patent in suit, implicitly anticipated the subject-matter of claim 1, and that therefore the priority document (D22) of the contested patent could not be regarded as the first invention in the sense of Article 87(1) EPC.

- 5.2 In particular, they argued that D1 disclosed (page 11, lines 14-18 and 30-32 and claim 1, step (c)) the formation of 1234ze and 1234yf from a mixture of 245eb and 245fa. Since claim 1 did not exclude the presence of 245fa, it followed that this document anticipated the subject-matter of claim 1.

Furthermore, the dehydrofluorination of 245eb to form 1234yf in table 1 (7th line) of D2 implicitly anticipated the subject-matter of claim 1 because, according to paragraph 26 of this document, the reactions shown in table 1 could lead to the formation of more than one hydrofluoroolefin. Since both the reaction conditions and the catalyst disclosed in D2 (see par. [0051-0053], [0036] and [0046]) were the same as those proposed in the patent in suit, it followed that the simultaneous production of 1234ze and 1234yf from 245eb was implicit when applying the principles underlying decision T 12/81. Additionally, the test report filed as D2a by appellant 2 during opposition proceedings would also prove that if example 4 of this document were carried out using 245eb as starting substance, both 1234yf and 1234ze would be obtained as reaction products. Moreover, document D26 disclosed (par. bridging columns 2 and 3) the formation of two isomers of tetrafluoropropene (one of them being 1234ze) from 245fa, which further supported the argument that the dehydrofluorination from pentafluoropropane could affect all the different

positions of the molecule to form more than one hydrofluoroolefin.

Finally, example 2 of document D23 described the dehydrofluorination of 245eb and 236ea (1,1,1,2,3,3 hexafluoropropane) to give 1234yf and 1225ye (1,2,3,3,3 pentafluoropropene). Since the conditions and the catalyst proposed in this example corresponded to the preferred options described in the patent in suit, it followed that the production of 1234ze was implicitly anticipated by this document (i.e. it was likely part of the portion designated as unknown in table 2). The opponents also cited example 3 of D5 (claiming priority from D23), which referred to the same reaction and disclosed both 1234ze and 1234yf as reaction products. The step of recovery as defined in point (b) of claim 1 of the patent in suit was also implicit, because this step was necessary for the GC-MS analysis and was in any case a trivial consideration for the skilled person.

5.3 The board does not agree with the above arguments for the following reasons:

Concerning D1, the board notes that point (a) of claim 1 at issue requires that the dehydrofluorination of 245eb provides a mixture comprising 1234ze and 1234yf. By contrast, document D1 indicates (page 18, lines 23-25) that the 1234ze and the 1234yf are respectively obtained from the dehydrofluorination of 245fa and 245eb. This document thus does not clearly and unambiguously anticipate step (a) of claim 1 at issue.

Concerning D2, the board notes that the principles underlying decision T 12/81 (see reasons 7 and 8) apply solely to situations in which the reactions conditions



are described in detail and in which such conditions would inevitably result in the formation of certain reaction products. This is clearly not the case in D2, since the dehydrofluorination of 245eb described in table 1 is not linked to specific reaction conditions. Even if this particular reaction were considered to take place under the conditions set out as preferred in document D2, the fact that both 1234ze and 1234yf would be simultaneously produced under some conditions falling within the preferred ranges does not lead to the conclusion that this is necessarily the case (i.e. for any combination falling within those ranges). It is also noted that the tests performed in D2a do not reproduce example 4 of D2, because 245eb is used as starting substance instead of 245cb. Finally, even if the board were to conclude that both 1234ze and 1234yf are produced, the document would still fail to anticipate the step of recovering these two products from the mixture as defined in claim 1, point (b), because such step requires the identification and separation of the substance. In other words, although (as the proprietor argued) the concept of recovering a synthesised product is as such trivial, it still requires that the substance in question is identified as part of the mixture. Consequently, even if 1234ze were part of the unknown mixture, this substance would remain unrecognised and would therefore be rejected with the rest of the by-products rather than being recovered.

Document D26 does also not appear to be relevant, because the cited dehydrofluorination reaction does neither start from 245eb nor does it produce 1234yf. Furthermore, the catalyst is a cubic chromium trifluoride catalyst, which falls outside the scope of claim 1 at issue.

While example 2 of document D23 provides a detailed description of reaction conditions which fall within the preferred ranges of the patent in suit, there is no evidence that both 1234ze and 1234yf would be produced under those specific conditions, moreover considering that the presence of 235ea together with the 245eb would likely have an influence on the reaction products. Furthermore, example 3 of document D5 does not correspond to example 2 of D23, at least because the temperature used in that example is 375°C (vs. 400°C in D23). In any case, here there is also no basis to conclude that the unexpected reaction product 1234ze would be identified and recovered from the mixture as required by step (b) of claim 1. In this respect, it is noted that the use of GC-MS (Gas Chromatography-Mass Spectrometry analysis) simply implies that the substances in the mixture are chromatographically separated and analysed in a mass spectrometer (i.e. they are separated and identified, yet they are not recovered).

5.4 The Board is therefore of the opinion that none of the cited documents clearly and unambiguously anticipate the subject-matter of claim 1, and that, consequently, the patent in suit validly claims priority from document D22.

6. Auxiliary request 11 - Article 54 EPC

The subject-matter of the claims is considered to be novel in view of the cited prior art for the following reasons:

6.1 The opponents (referring to claim 1 of the main request and auxiliary requests 1-3) argued that claim 1 at issue was not novel in view of documents D2, D5 (under

Article 54(3) EPC), D6 and D7 for the following reasons:

Concerning D6, reference was made to examples 7 and 8, which disclosed the formation of 1234yf from 245eb. Since the last paragraph of page 3 explicitly indicated that the formation of "1234yf and/or 1234ze" was preferred, it would be implicit that the examples should be carried out to ensure that these reaction products were obtained. The experimental tests performed by appellant 2 (see point 5.3.3 of its statement of grounds of appeal) reproducing examples 7 and 8 also supported the argument that both 1234yf and 1234ze would inevitably be obtained from these examples. Furthermore, the description on page 3 could, as such, be regarded as anticipating the subject-matter of claim 1 when the option "F" was selected for both Xs in formula I.

Document D7 described the dehydrofluorination of 245eb in the presence of an alumina catalyst to form 1234yf (example 6, page 24). The formation of 1234ze would again be implicit in view of the reaction conditions following the principles of T 12/81.

Regarding documents D2 and D5, see the opponents' argumentation in section 5. above.

6.2 The Board disagrees with the above arguments for the following reasons:

As indicated above, the board does not consider that documents D2 and D23 (priority document of D5) clearly and unambiguously anticipate the subject-matter of claim 1. Thus, to the extent that the priority of the

patent in suit is considered to be valid, document D5 would not constitute prior art under Article 54(3) EPC.

Concerning D6, the board notes that the reference to the preferred formation of "HFO-1234yf and/or HFO-1234ze" merely informs the reader that the multiple reactions in the specification are aimed at obtaining at least one of these products. However, when the document refers to the conversion of 245eb in particular in examples 1-16, the only reaction product which is identified is 1234yf (yet not 1234ze). The tests performed by appellant 2 can also not support the presence of 1234ze as reaction product in examples 7 and 8 of D6, because they differ from these examples at least in the temperatures used (400°C in the tests vs. 420 and 440°C in examples 7 and 8) and in the selectivity to 1234yf (84,89% in the tests vs. 47% and 43% in examples 7 and 8). The general disclosure on page 3 of D6 can also not be seen as a direct and unambiguous anticipation of the subject-matter of claim 1, because this would imply at least three purposeful selections from lists of alternatives: a first and a second selection of the option "F" for the Xs of formula I and a further selection of the option "HFO-1234yf and HFO-1234z" from the list of alternatives implicit in the expression "and/or". In any case, neither this general disclosure nor the examples in D6 concerning the dehydrofluorination of 245eb includes a catalyst *"selected from the group consisting of fluorided alumina, aluminum fluoride and mixtures thereof"* as defined in claim 1 at issue.

Finally, the arguments brought forward for D7 appear to be similar to those presented for D2 and D23 above. The board is thus of a similar opinion, namely that no direct and unambiguous disclosure can be acknowledged

following the principles of T 12/81 by merely pointing out that the reaction is conducted under conditions which fall within preferred ranges of the underlying invention. In any case, even if 1234ze were part of the "unknown" product in example 6, this substance is not identified and would therefore be rejected rather than separated and recovered from the mixture as defined in claim 1, step (b).

6.3 The board therefore concludes that claim 1 at issue (and by the same token that of the claims depending thereon) is novel in view of the cited prior art documents.

7. Auxiliary request 11 - Article 56 EPC

The subject-matter of the claims at issue is considered to be inventive for the following reasons:

7.1 Closest prior art

The opponents referred to document D2 as the closest prior art and the board agrees that it represents a suitable starting point because it discloses:

- a) the reaction of 245eb to obtain 1234yf (table 1);
- b) the reaction of 245fa to obtain 1234ze (example 2);

and

- c) the reaction of 245cb to obtain 1234yf (example 4)

and thus refers to dehydrofluorination reactions involving both the starting substance (245eb) and the reaction products (1234yf and 1234ze) defined in claim 1 at issue. This document also discloses *inter alia* (par. [0035]) fluorinated alumina and aluminium fluoride catalysts, as well as (par [0051]) temperature ranges of 300°C to 450°C, so it anticipates (at least

as options) both the preferred catalysts and the temperatures of the invention.

The subject-matter of claim 1 at issue thus differs from the dehydrofluorination reaction of 245eb in document D2 in that 1234ze is further obtained (together with the 1234yf) and recovered from the final mixture.

## 7.2 Problem solved

7.2.1 According to paragraph [0006], the patent in suit intends to propose a new manufacturing process for the simultaneous production of 1234yf and 1234ze.

7.2.2 The opponents argued that the only problem solved by the invention was that of providing an alternative process.

7.2.3 The board however notes that since the process defined in claim 1 at issue explicitly defines the generation and recovery of both isomers 1234yf and 1234ze, and since this step (at least with respect to 1234ze) represents a differentiating feature with respect to the closest prior art, the process in claim 1 cannot simply constitute an alternative, but instead should be regarded as a new manufacturing process.

The board therefore concludes that the problem solved by the invention is to propose a new manufacturing process for the simultaneous production of multiple tetrafluoropropene isomers.

## 7.3 Non-obviousness of the proposed solution

7.3.1 The opponents argued that document D2 explicitly indicated (par. [0026]) that the reactions in table 1 could give rise to more than one hydrofluoroolefin, and it was apparent from examples 2 and 4, concerning dehydrofluorination of isomers of 245eb, that the conditions proposed in this document could lead to the formation of both 1234yf and 1234ze. The subject-matter of claim 1 was therefore obvious in view of the teachings of document D2 alone.

Furthermore, even if D2 were not considered to render claim 1 obvious, the gap would be filled by either document D16 or D21.

Document D16 described (claim 1, step c)) a process for synthesising 1234ze from a compound of the formula  $\text{CF}_3\text{CHX}^1\text{CH}_2\text{X}^2$ , wherein  $\text{X}^1$  and  $\text{X}^2$  were independently selected from a halogen F, Cl, Br or I. According to dependent claims 7 and 11,  $\text{X}^1$  and  $\text{X}^2$  were preferably the same, so when the alternative fluorine (F) was selected for these embodiments the starting substance was 245eb. It was therefore evident for the skilled person that the dehydrofluorination of 245eb also led to the formation of 1234ze.

Document D21 disclosed in par. 1390 on page 492 that the elimination of HF from 1,1,1,2,3,3 pentafluoropropane could proceed into different directions, yielding all possible isomers as products. Since D21 was a chemistry textbook, it would reflect common general knowledge, implying that when starting from D2, the skilled person would be aware that the elimination of HF from 245eb would give rise to both 1234ze and 1234yf.

7.3.2 The board does not follow this argumentation because the inventive contribution of claim 1 is based on the realisation that, under the conditions defined therein, a dehydrofluorination reaction of 245eb gives rise to the simultaneous synthesis of both 1234yf and 1234ze. Neither D2 nor any of the other cited documents D16 or D21 provide information which would render this contribution obvious.

Document D2 refers to a plurality of dehydrofluorination reactions. The general teaching provided in paragraph [0026] merely points to the verifiable fact (see some of the entries in table 1) that some of the reactions might give rise to more than one hydrofluoroolefin. This is however not the case for 245eb in particular, which is said to give rise solely to 1234yf. There is thus no reason to conclude that the skilled person would combine table 1 and paragraph [0026] to conclude that 245eb can react to give more than one hydrofluoroolefin, let alone that the second hydrofluoroolefin would necessarily be 1234ze. Examples 2 and 4 are also not relevant, because they concern different isomers of 245eb, and it is well-known that despite having the same general chemical formulation, the chemical behaviour of isomers might differ significantly. In any case, it is not apparent why the teachings of the examples should be combined among them and/or with the contents of table 1, let alone how this combination would render the subject-matter of claim 1 obvious.

The board is also not convinced that the skilled person would consider the disclosure of D16 when starting from D2 as closest prior art to solve the underlying technical problem, because document D16 explicitly indicates (page 5, last line) that "X<sup>1</sup> is preferably



not F", so a skilled person would not consider the teachings in this document when looking for a new manufacturing process starting from 245eb (in which  $X^1=F$ ). In any case, two selections from a list ( $X^1=F$  and  $X^2=F$ ) would be required to arrive at 245eb as starting substance, and even after combining the resulting disclosure with the teachings of D2, this would only lead to the conclusion that 245eb can be used to obtain either 1234yf (as disclosed in D2) or 1234ze (as disclosed in D6), not that it can yield both 1234ze and 1234yf at the same time under certain conditions as defined in claim 1.

Document D21 does not refer to the starting substance 245eb (pentafluoropropane) but to a hexafluoropropane, so it is not apparent why this disclosure would be taken into account, let alone how it could lead to the conclusion that both 1234yf and 1234ze can be simultaneously recovered from a dehydrofluorination reaction of 245eb.

Finally, the board notes (for the sake of completeness) that none of the other documents cited by the opponents recognises that the dehydrofluorination 245eb would lead to the simultaneous formation of 1234yf and 1234ze, so even if it were assumed that the conditions and catalysts used in some examples (e.g. example 6 of D7) might lead to the formation of 1234ze, there is no reason to conclude that the skilled person would identify and recover this substance from the mixture as defined in claim 1 at issue.

The board therefore concludes that the subject-matter of claim 1 (and by the same token that of the claims depending thereon) is not rendered obvious by the cited

prior art. The requirements of Article 56 EPC are therefore met.

8. Since none of the documents D24, D25 and D27 to D31 affects the outcome of the proceedings, there is no need to decide on their admittance. Furthermore, while document D26 was cited and therefore implicitly admitted, its content did not affect the outcome of the proceedings.
  
9. In view of the above arguments and conclusions, the board concludes that auxiliary request 11 complies with the requirements of the EPC.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of the claims of auxiliary request 11 filed with the letter dated 25 July 2018, and a description to be adapted where appropriate.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated