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Datasheet for the decision of 19 March 2026

Case Number: T 0895/24 - 3.3.09

Application Number: 17152564.5

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Language of the proceedings: EN

Title of invention:
PROCESS FOR THE PRODUCTION OF HFO TRANS-1234ZE FROM HFC-245FA

Patent Proprietor:
Honeywell International Inc.

Opponent:
Mexichem Fluor S.A. de C.V.

Headword:
Production of HFO trans-12334ZE/HONEYWELL

Relevant legal provisions:
EPC Art. 100(a), 100(c), 56, 76(1), 123(2)

Keyword:
Grounds for opposition - extension of subject-matter (yes)
Amendments - main request and auxiliary requests 1 to 17 - allowable (no) - auxiliary request 18 - allowable (yes)
Inventive step - auxiliary request 18 (yes)

Decisions cited:
G 0002/10, G 0002/21, T 1241/03, T 0056/08, T 0681/21

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Case Number: T 0895/24 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 19 March 2026

Appellant: (Patent Proprietor)	Honeywell International Inc. 115 Tabor Road M/S 4D3 Morris Plains, NJ 07950 (US)
Representative:	Stepney, Gregory John Withers & Rogers LLP 2 London Bridge London SE1 9RA (GB)
Appellant: (Opponent)	Mexichem Fluor S.A. de C.V. Eje 106 (sin número) Zona Industrial C.P. 78395 San Luis Potosi, S.L.P. (MX)
Representative:	Potter Clarkson Chapel Quarter Mount Street Nottingham NG1 6HQ (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted/ electronically transmitted on 6 May 2024 concerning maintenance of the European Patent No. 3176147 in amended fo rm.**

Composition of the Board:

Chairman	A. Haderlein
Members:	C. Meiners
	A. Jimenez

Summary of Facts and Submissions

I. The appeals were filed by the opponent and the patent proprietor against the opposition division's interlocutory decision finding that the European patent as amended according to auxiliary request 18, filed during oral proceedings on 10 April 2024, meets the requirements of the EPC. As both parties are appellants, they will continue to be referred to as the opponent and the patent proprietor in the following.

II. In its notice of opposition, the opponent had requested that the patent be revoked in its entirety on the grounds under Article 100(a) (lack of novelty and lack of inventive step) and 100(c) EPC in conjunction with Articles 76(1) and 123(2) EPC.

III. The following documents are relevant for the present decision:

D2 JP 11-140002
D2a Translation of D2 into English
D3 US 6,124,510
D6 US 5,986,151
D17 Declaration by Dr Robert Syvret
D23 US 2,892,000
D24 US 3,235,612
D25 GB 921,254
D26 CA 675318 A
D27 Declaration by Dr Haiyou Wang

IV. In its decision, the opposition division found, *inter alia*, that the subject-matter of claims 4 and 10 as

granted extended beyond the content of the application as filed. Moreover, auxiliary requests 1 to 17 contained amendments that did not meet the requirements of both Articles 76(1) and 123(2) EPC; however, auxiliary request 18 filed during the oral proceedings before the opposition division was admitted and held to meet the requirements of both Articles 76(1) and 123(2) EPC. Likewise, the claimed subject-matter was novel and also involved an inventive step in view of D2/D2a as the closest prior art. Therefore, the patent on the basis of auxiliary request 18 and the description adapted to it complied with the requirements of the EPC.

V. Both parties lodged appeals against that decision.

VI. On appeal, the patent proprietor filed a total of 25 auxiliary requests, of which only auxiliary requests 1 to 18 are relevant for the present decision.

VII. Wording of the relevant claims

Claim 1 as granted reads as follows:

"*A process for the production of trans-1,3,3,3-tetrafluoropropene which comprises:*

(a) dehydrofluorinating 1,1,1,3,3-pentafluoropropane in the absence of an oxygen-containing gas to thereby produce a result comprising cis-1,3,3,3-tetrafluoropropene, trans-1,3,3,3-tetrafluoropropene and hydrogen fluoride, wherein the dehydrofluorinating is conducted with a catalyst comprising fluorinated Cr_2O_3 *in bulk form;*
(b) optionally recovering hydrogen fluoride from the result of step (a); and

(c) distilling the result of step (a) or step (b) to recover trans-1,3,3,3-tetrafluoropropene."

Claim 4 as granted reads as follows:

"*The process of claim 3 further comprising the subsequent step of recovering at least one of hydrogen fluoride, cis-1,3,3,3-tetrafluoropropene and 1,1,1,3,3-pentafluoropropane from the residue.*"

Claim 10 as granted reads as follows:

"*The process of any preceding claim, which is a continuous, integrated manufacturing process for the production of trans-1,3,3,3-tetrafluoropropene.*"

The following amendments have, *inter alia*, been made to auxiliary requests 1 to 18, on which the present decision is based.

i) Reversion to the wording of claim 4 as originally filed, namely (underlining and strikethrough inserted by the board) in auxiliary requests 1, 3, 5, 7, 9 and 11:

"*The process of claim 3 further comprising the subsequent step of <u>individually</u> recovering ~~at least one of~~ hydrogen fluoride, cis-1,3,3,3-tetrafluoropropene and 1,1,1,3,3-pentafluoropropane from the residue.*"

ii a) Insertion of the underlined feature at the end of claim 10 as granted into claim 10 of auxiliary requests 2, 3, 11 and into the corresponding claim 5 of auxiliary request 13:

"*The process of any preceding claim, which is a continuous, integrated manufacturing process for the production of trans-1,3,3,3-tetrafluoropropene, wherein step (a) is conducted in the vapor phase and step (b) is conducted.*"

ii b) Insertion of the underlined feature at the end of claim 10 as granted into claim 10 of auxiliary requests 6, 7, 10 and into the corresponding claim 5 of auxiliary requests 15 and 17:

"*The process of any preceding claim, which is a continuous, integrated manufacturing process for the production of trans-1,3,3,3-tetrafluoropropene, wherein step (b) is conducted.*"

Finally, the subject-matter of claim 1 of auxiliary request 18 (held allowable by the opposition division) corresponds to claim 1 as granted, and claim 4 corresponds to the original claim 4 by applying amendment i). In addition, claim 10 as granted was deleted from that request. The remaining dependent claims, claims 2, 3 and 5 to 9, are unchanged (as granted).

VIII. The **patent proprietor's** arguments, where relevant to the present decision, can be summarised as follows.

- The subject-matter of claims 1, 4 and 10 as granted did *not extend beyond the content* of the *earlier application* and of the *application as filed*. The catalyst used in Example 1 was a signpost towards the catalyst from claim 1.

- With regard to *inventive step*, the claimed subject-

matter of all the requests was inventive in light of document D2/D2a as the closest prior art.

The subject-matter of claim 1 as granted differed from the teaching of D2 on account of i) the use of fluorinated Cr_2O_3 in *bulk* form and ii) the absence of an oxygen-containing gas in the dehydrofluorination. The demonstrated technical effects achieved by the claimed process were higher conversion of starting material, lower amounts of unknown by-products and a higher *trans*/*cis*-isomer ratio for the tetrafluoropropene obtained. Reliance on these effects was in line with the principles established in G 2/21. At the same time, the process in claim 1 was stable without needing an oxygen-containing gas. Consequently, the objective technical problem coincided with providing these effects.

The solution was not obvious from D2 alone or in combination with D3 or D6 as secondary information sources.

- Similarly, the subject-matter of auxiliary requests 1 to 18, *inter alia*, was allowable and met the requirements of the EPC.

IX. The **opponent's** arguments, where relevant to the present decision, can be summarised as follows.

- The subject-matter of claims 1, 4 and 10 as granted *extended beyond the content* of the *earlier application* and of the *application as filed*. As regards claim 1 as granted, multiple selections were necessary to arrive at dehydrofluorination of pentafluoropropane using a catalyst which *is* a fluorinated Cr_2O_3 bulk catalyst in the absence of an oxygen-containing gas. In this

context, a catalyst *comprising* a fluorinated Cr_2O_3 bulk catalyst was not disclosed in the (parent) application.

In addition, the new arguments presented in respect of the basis for claim 4 as granted should not be admitted.

- Claim 1 of the main request (as granted) *lacked an inventive step* in view of document D2/D2a alone or in combination with D3 or D6.

No technical effect had been substantiated that could be causally attributed to the sole distinguishing feature, this being the use of fluorinated Cr_2O_3 in bulk form. The proprietor could not rely on post-published evidence to support the purported technical effects. These effects were not encompassed by the technical teaching and embodied by the same originally disclosed invention, and the data did not credibly demonstrate any technical effect, either. The objective technical problem in view of D2 was thus merely to provide processes using an alternative catalyst. The solution to this problem was obvious from D2 alone or in combination with the secondary teaching of D3 or D6.

- The amendments made to auxiliary requests 1 to 18 did not overcome the objections raised.

X. The **patent proprietor** requested that the decision be set aside and that the patent be maintained as granted. As an auxiliary measure, the patent proprietor requested that the patent be maintained on the basis of one of auxiliary requests 1 to 18 underlying the decision under appeal, or on the basis of one of auxiliary requests 19 to 22 as referred to in the decision under appeal, or on the basis of one of

auxiliary requests 23 to 25 filed with the letter dated 23 February 2026.

The **opponent** requested that the decision under appeal be set aside and that the patent be revoked.

Reasons for the Decision

1. Amendments - main request

1.1 The description and claims of the application as originally filed and the parent application on which the application is based are identical. Consequently, the findings set out below with respect to the application as filed also apply to the parent application as filed.

1.2 Claim 1 as granted

1.2.1 The opponent submitted that claim 1 as granted, which also forms part of auxiliary request 18, *inter alia*, was partly based on claim 1 of the application as originally filed, but had been further amended:

(i) to limit the dehydrofluorination reaction in step (a) to being carried out "in the absence of an oxygen-containing gas",

(ii) to limit the dehydrofluorination reaction in step (a) to being "conducted with a catalyst comprising fluorinated Cr_2O_3 in bulk form", and

(iii) to limit the recovery of trans-1234ze (trans-1,3,3,3-tetrafluoropropene) in step (c) to being by "distilling the result of step (a) or step (b)".

1.2.2 According to the opponent, there was a basis for feature (iii) in the application as filed; however, multiple selections were required to arrive at a catalyst that is fluorinated chromia in bulk form (cf. feature ii) and to stipulate that the reaction be carried out in the absence of an oxygen-containing gas (feature i).

1.2.3 With regard to feature (i), the board agrees with the patent proprietor that the paragraph bridging pages 2 and 3 of the application as filed highlights the absence of an oxygen-containing gas as a preferred feature ("in particular"; see page 2, line 28 to page 3, line 4).

The opponent countered that this passage of the application related to the prior art rather than to the disclosure of the application. According to the opponent, the exclusion of an oxygen-containing gas in step a) had merely been mentioned in the aforementioned sentence in order to delimit the application from D3, which was mentioned on page 2, line 13.

In the board's view, these arguments are not convincing. In the sentence spanning lines 25 to 26 preceding the passage referred to by the opponent, reference is clearly made to "the present invention". The fact that the sentence in question was mentioned in order to delimit the invention from the prior art speaks in favour of this feature being disclosed as a preferred feature of the invention. Likewise, the word "in particular" in the following sentence bridging pages 2/3 signals that the embodiment depicted constitutes a preferred one, rather than merely implying a distinction from the process in D3.

The fact that the absence of oxygen is not mentioned in the examples of the application is not at odds with this conclusion. Instead, reference is made to the optional presence of an inert gas diluent such as nitrogen or argon on page 4, lines 19 to 20 as filed. This passage also indicates that amendment (i) is a preferred feature, and thus no particular selection has to be made to include this feature in claim 1, or there is at least a pointer towards including this feature.

1.2.4 Regarding feature ii), there is agreement that the passage on page 4, lines 11 to 18 depicts catalysts that can be used in the dehydrofluorination reactions yielding 1,3,3,3-tetrafluoropropene.

1.2.5 This passage reads as follows: "*These may be single or multiple tubes packed with a dehydrofluorinating catalyst which may be one or more of fluorinated metal oxides in bulk form or supported, metal halides in bulk form or supported, and carbon supported transition metals, metal oxides and halides. Suitable catalysts non-exclusively include fluorinated chromia (fluorinated Cr_2O_3), fluorinated alumina (fluorinated Al_2O_3), metal fluorides {e.g. CrF_3, AlF_3) and carbon supported transition metals (zero oxidalion state) such as Fe/C, Co/C, Ni/C, Pd/C or transition metals halides.*"

1.2.6 However, the opponent submitted that multiple independent selections were necessary to arrive at dehydrofluorination of 1,1,1,3,3-pentafluoropropane using a catalyst which is a fluorinated Cr_2O_3 bulk catalyst in the absence of an oxygen-containing gas. This first required selecting metal oxide in the first sentence on page 4, lines 11 to 14 of the application. This sentence was the starting point, as it also

referred to useful catalysts in a more general form, while the catalysts in the following sentence represented more specific embodiments of them. Second, the bulk form of metal oxides had to be chosen over supported catalysts. Third, fluorinated chromia had to be selected in the second sentence (lines 14 to 18) over fluorinated alumina. There was no pointer to this selection that could be derived from the examples, either.

1.2.7 In the board's view, the opponent's assessment that the examples did not reflect any preference for fluorinated Cr_2O_3 and that Example 1 did not expressly disclose that the dehydrofluorination had been conducted in the absence of oxygen and using a catalyst in bulk form is not convincing. The board has no doubt that Example 1 points to the use of a fluorinated Cr_2O_3 catalyst in bulk form. Moreover, the absence of oxygen in the dehydrofluorination step a) is preferred in the application for the reasons indicated above. The board hence concludes that the application as filed points to the use of a dehydrofluorination catalyst in step a) that is fluorinated Cr_2O_3 in bulk form, also in the absence of oxygen.

1.2.8 As regards the opponent's argument that there was no preference for the catalyst in Example 1 in the application, the board disagrees. It is true that different catalysts used in the dehydrofluorination in Example 2 achieve at least the same level of conversion of the starting compound 1,1,1,3,3-pentafluoropropane and production of trans-1,3,3,3-tetrafluoropropene. Nevertheless, the amount of "unknowns" is higher in those runs in Example 2, meaning that these compounds plausibly cannot be recycled and thus constitute waste (contrary to the starting compound and the cis-isomer

of 1,3,3,3-tetrafluoropropene that can be recycled). In sum, the application points to the catalyst used in Example 1, i.e. to fluorinated Cr_2O_3 in bulk form.

1.2.9 In this context, the opponent submitted that, apart from needing multiple selections to arrive at a fluorinated Cr_2O_3 catalyst in bulk form, a catalyst comprising a fluorinated Cr_2O_3 bulk catalyst was not disclosed in the application at all. In particular, all the examples of the application involved the use of catalysts that are one of those recited in the aforementioned second sentence on page 4.

Similarly, the expression "[dehydrofluorinating catalyst] which may be one or more of" (emphasis by the opponent) in the first sentence on page 4 limited the catalyst to be employed to the list (of components) that followed. Extending that list to the open-ended "comprising" language constituted an inadmissible generalisation. The expression "[s]uitable catalysts non-exclusively include [...]" in the second sentence merely meant that the list of more specific catalysts listed there was non-exclusive and included a catalyst that is, rather than comprises, fluorinated chromia/ Cr_2O_3 (underlining by the board). The new technical information introduced whereby the catalysts can comprise any further components in addition to the specifically recited catalysts was thus not disclosed in the application as filed.

1.2.10 In the board's view, amendment ii) results from information derived from both the first *and* second sentence in said passage on page 4, lines 11 to 18. In the first sentence, reference is made to fluorinated metal oxides in bulk form, *inter alia*. In the following, reference is made to fluorinated chromia. In

the board's opinion, selecting fluorinated chromia in bulk form as such does not create fresh subject-matter. Even when arguing that making a selection between bulk and supported catalysts in said first sentence would constitute a first selection step from non-convergent alternatives, Example 1 points to this feature combination with fluorinated chromia.

1.2.11 What remains to be elucidated is whether or not applying the information from the first sentence "fluorinated metal oxides in bulk form" to the following sentence of said passage on page 4 constitutes an inadmissible generalisation. This is the opponent's position, since the first sentence disclosed a *closed* list of catalyst categories. In other words, it is under scrutiny whether it can be directly and unambiguously inferred from this passage that any other component besides fluorinated chromia can be present in the catalyst, rather than only the specific materials recited in the first sentence. The opponent also stressed that, in the examples of the patent application, only a single material was used, namely fluorinated chromia or metal fluorides or carbon supported transition metals. A pointer to the "comprising" language was thus also missing from the examples.

1.2.12 The board is not convinced by these arguments. As correctly pointed out by the patent proprietor, some members of the list in the second sentence exhibit the same degree of generality as those in the first sentence, in particular carbon supported transition metals and transition metal halides. While the second sentence is directed to the same topic, there is thus no inextricable link between them in the sense that the catalysts mentioned in the second sentence would

necessarily result as a more specific selection of more general catalyst classes referred to in the preceding sentence.

Moreover, as convincingly submitted by the patent proprietor, the wording "non-exclusively include" in the second sentence directly and unambiguously teaches an open formulation of the composition of suitable catalysts, in the sense that they can comprise any member from the following list. This is also supported by the case law of the boards referred to by the proprietor, according to which the expression "include" can be taken to be synonymous with "comprise", as mentioned in particular in decisions T 1241/03 (point 12 of the Reasons) and T 56/08 (cf. point 2.5 of the Reasons) in this regard.

1.2.13 It is for these reasons that the feature combination in claim 1 as granted does not go beyond the content of the application as filed and of the parent application as filed.

1.3 Claim 4 as granted

1.3.1 Claim 4 differs from the "original" claim 4 as set out below:

"The process of claim 3 further comprising the subsequent step of ~~individually~~ recovering at least one of hydrogen fluoride, cis-1,3,3,3-tetrafluoropropene and 1,1,1,3,3-pentafluoropropane from the residue."

1.3.2 As concluded by the opposition division, the original claim 4 clearly requires that each of the aforementioned three components has to be individually recovered when present. This is indicated by the

conjunction "and", which cannot be equated with "and/or". It is not formalistic to conclude that the expression "a residue comprising one or more of [...]" in the original claim 3 cannot serve as a basis for stipulating "at least one of [...]" in claim 4 as granted. Claim 3 merely specifies the components of the residue.

The original claim 5, referring back to claim 3 rather than to claim 4 as filed, relates to a different embodiment. It does not allow for the isolated recovery of hydrogen fluoride from a mixture also comprising the other aforementioned compounds. In addition, the original claim 5 calls for the *recycling* of recovered compounds back to step (a). Claim 5 as filed thus cannot serve as a basis for this amendment either.

1.3.3 The paragraph bridging pages 8 and 9 of the application does not support this amendment either. For instance, it is not disclosed that only HFC-245fa (1,1,1,3,3-pentafluoropropane) is recovered but is not recycled back for subsequent dehydrofluorination reactions. Moreover, the expression "[and] any HF present in the bottoms of the distillation may also be recovered" does not unambiguously indicate that *only* HF (hydrogen fluoride) could be recovered (*and recycled back*) if HFC-245fa and/or cis-1,3,3,3-tetrafluoropropene are present in the distillation residue. The fact that page 3, line 4 and page 12, lines 1 to 2 of the original description convey that starting materials and by-products (such as HF) can *optionally* be recycled does not change this conclusion. These passages relate to *different embodiments* and not to the *specific* information provided in e.g. the original claim 5 or in the paragraph bridging pages 8 and 9.

G 2/10 emphasises that the new feature *combination* examined as to its compliance with Article 123(2) EPC needs to be disclosed in the application as filed (point 4.5.2, first paragraph, of the Reasons). This new feature combination of claim 4 as granted, however, is not disclosed in the (parent) application, let alone in combination with the features of claim 1 as granted.

The admittance of the new arguments based on these passages of the description thus does not need to be addressed.

1.3.4 It follows that the subject-matter of claim 4 as granted is not originally disclosed in the (parent) application.

1.4 Claim 10 as granted

1.4.1 In the decision under appeal, the opposition division concurred with the opponent that the omission of both i) the dehydrofluorination in vapour phase in step (a) and ii) the obligate step (b) in claim 10 as granted compared with the original claim 10 created an inadmissible intermediate generalisation. The original claim 10 and the corresponding passage on page 3, line 22 *et seq.* were the sole passages that disclosed a continuous integrated process and represented a "stand-alone embodiment" (see paragraphs 83 and 84 of the decision under appeal). There was no basis for combining this embodiment of the original independent claim 10, let alone the intermediately generalised subject-matter of claim 10 as granted, with the special features of the higher-ranking claims. The subject-matter of claim 10 as granted thus did not comply with Articles 76(1) and 123(2) EPC.

1.4.2 The patent proprietor challenged this conclusion by referring, *inter alia,* to page 2, line 25 to page 3, line 4, page 3, line 22 *et seq.*, and claim 10 of the parent application. According to the proprietor, these passages support a "continuous integrated" mode of carrying out the process in a general form.

1.4.3 The board agrees with the corresponding findings by the opposition division (see decision under appeal, points 83 and 84). In this regard, the additional arguments presented by the proprietor on appeal are not convincing for the following reasons.

While it is true that the application discloses, in separate embodiments, that individual steps of the process, either downstream or upstream, can be carried out in a continuous manner, this does not necessarily imply that other steps of the process will also be carried out in a continuous mode. Continuous recovery of HF in gaseous phase (with the latter feature also missing from claim 10 as granted), as referred to on page 7, lines 23 to 26 of the application, does not mean that other process steps need to be continuous. The latter passage moreover requires further process conditions that are also missing from claim 10 as granted. Similarly, the recovery of HFC-245fa from cis-1234ze (cis-1,3,3,3-tetrafluoropropene) by fluorination, as referred to on page 12, lines 11 to 24, relates to a single operation forming part of a process step. In that process step, chlorine can be charged in either a batch or a continuous mode in the fluorination of the cis-isomer back to the starting compound. Charging the chlorine used in this fluorination in a continuous mode does not mean that the recovered product is also continuously re-

introduced into the reactant feed (to support and point to a continuous integrated process).

This conclusion of an inadmissible intermediate generalisation is not changed by the fact that the application as filed presents step (b) as an optional step, which is stated e.g. on page 2, line 25 to page 3, line 4. Applying this teaching to other passages of the description, such as to page 3, lines 21 to 28, which mirrors claim 10 as filed, would lead to inadmissible mosaicking of features. Again, this would result in a *feature combination* that is not directly and unambiguously derivable from the application as filed.

The proprietor also referred to page 8 (see line 5 onwards) of the application as filed to support the fact that the recovery of hydrogen fluoride in step b) was optional. This misses the point: it may well be that this specific embodiment, disclosed among many other separate embodiments in the application, supports the fact that hydrogen fluoride can be recovered or removed using e.g. caustic scrubbers and that this embodiment would be compatible with an integrated process. Neither this option nor the fact that hydrogen fluoride may be selectively distilled off from the raw product as a further option due to a higher boiling point (see page 8, lines 23 to 25), and hence the option to omit step b) for this reason, can provide a clear and unambiguous basis for the feature *combination* of claim 10 as granted.

Therefore, the feature combination of claim 10 as granted is the result of an inadmissible intermediate generalisation over the disclosure of the application as filed.

1.4.4 This situation is in fact aggravated by the insertion of a back-reference to any preceding claim into claim 10 as granted. By contrast, the original claim 10 constituted an independent embodiment, formulated as an independent claim. In this context, by way of example, the opponent persuasively referred to the now explicit feature combination of claims 1, 7 (liquid phase fluorination) and 10 (continuous integrated manufacturing process) as granted.

To address this objection, the patent proprietor also referred to the possibility of conducting dehydrofluorination as described on page 5, line 15 *et seq.* in liquid phase. A reaction time was not indicated. This pointed to a continuous process rather than to a batch process. The board, however, observes that, while this passage would be compatible with a "continuous integrated" process, it first does not disclose it unambiguously, and even if the text did so, this option would be no more than one of many separate embodiments described in the application as filed.

Furthermore, it is true that the fluorination of cis-tetrafluoropropene back to the starting compound can optionally be conducted in liquid phase (see page 12 of the description) rather than in gas phase; however, a requirement for a continuous reaction rather than the possibility or option of it is not apparent to the board from this disclosure. This cannot be inferred from a reaction time not being indicated, either. Moreover, the indication that the cis-1234ze or the mixture of that compound and the starting compound and HF are fed to the reactor does not necessarily require a continuous process. This also holds true for the fact that a top catalyst stripper is optionally used, such

that unreacted HF and catalyst are refluxed back to the reactor, or for the fact that HFC-245fa is recovered. This is stated in the paragraph starting from line 26 on page 12 of the application as filed, to which the patent proprietor referred.

The patent proprietor's reference to the process in Example 3 of D3 does not support its case either. The prior-art document D3 does not reflect the disclosure of the application as filed.

1.4.5 To summarise, it follows that the subject-matter of claim 10 as granted is the result of an intermediate generalisation by omitting the fact that step a) is conducted in the vapour phase and that step b) is conducted. Moreover, the insertion of the originally undisclosed back-reference to any preceding claim creates feature combinations that are not directly and unambiguously derivable from the application as filed.

1.5 The ground for opposition under Article 100(c) EPC thus prejudices the maintenance of the patent as granted.

2. Inventive step - main request

2.1 Closest prior art

It is undisputed that D2, and in particular Examples 1 to 4, can serve as a starting point for assessing inventive step. The board thus sees no reason to deviate from this. Like the patent, D2 relates to the dehydrofluorination of 1,1,1,3,3-pentafluoropropane to 1,3,3,3-tetrafluoropropene.

2.2 Distinguishing features

2.2.1 The parties agree that the process according to claim 1 differs from D2 on account of the use of fluorinated Cr_2O_3 in bulk form. The patent proprietor submitted that the absence of an oxygen-containing gas was an additional distinguishing feature.

2.2.2 D2 does not mention the use of oxygen in the dehydrofluorination that is carried out in Examples 1 to 4. In these examples, it is disclosed that nitrogen gas was introduced into the reactor during the dehydrofluorination. While paragraph [13] sets out that supplying e.g. oxygen during the reaction was *also* effective for improving catalyst life, this option is not reflected in the examples. This means that the feature "in the absence of an oxygen-containing gas" is disclosed in D2. The patent proprietor's corresponding allegation that the examples of D2/D2a were not exhaustively defined is not convincing.

2.2.3 In this regard, the patent proprietor's reference to the case law is not pertinent; at best, the presence of oxygen in the examples of D2, and not, conversely, its absence, would be implicit. Similarly, the fact that Example 1 of D3 mentions the presence of oxygen in the reagent stream at 400°C is not at odds with these considerations: in that embodiment of D3, *bulk* fluorinated chromia is used. This catalyst does not contain heat-sensitive and oxygen-sensitive activated carbon as a carrier material.

2.2.4 Consequently, the board concurs with the opposition division that the sole distinguishing feature of claim 1 is that fluorinated chromia (Cr_2O_3) is used *in*

bulk form.

2.3 Technical effects and resulting objective technical problem

2.3.1 The board agrees that the improvements in terms of overall conversion, selectivity for trans-1234ze and reduced formation of unknown compounds have been credibly demonstrated in Table 1 of the patent and the evidence referred to in the patent proprietor's reply to the opponent's appeal. This being achieved also corresponds to the initial problem as perceived by a skilled person in light of paragraph [0005] of the patent and common general knowledge.

2.3.2 Particularly the data referred to in section 4.3.7 of the proprietor's reply to the opponent's appeal clearly demonstrate improved conversion, a higher trans:cis ratio for 1,3,3,3-tetrafluoropropene and lower amounts of unknown compounds formed (cf. point 4.4 of this reply). In the board's view, these effects are credibly associated with the distinguishing feature. These results are meaningful and also statistically significant (considering a threshold p-value of 0.05 for rejecting the null hypothesis being met). Reference is made to points 24 to 27 of declaration D27 in this context. Whether this threshold has "barely been met" (this was the opponent's position) is irrelevant for the conclusion of statistical relevance.

Likewise, the opponent's argument based on D17 that the technical effects demonstrated when using corrected relative values were rather small and exaggerated, also considering that they were based on raw GC (gas chromatography) values, is not convincing. As submitted by patent proprietor, it was standard practice to

quantify improvements as a percentage relative to the benchmark value to be improved.

Moreover, the opponent's allegation that the improved performance of the bulk fluorinated chromia catalyst would (at least as far as conversion is concerned) be attributable to the amount of chromia when compared with the supported catalyst is not persuasive. In this regard, the higher amount of chromia in the bulk catalyst would not explain, *inter alia*, the different trans/cis-selectivities for 1,3,3,3-tetrafluoropropene observed in the experimental data provided by the patent proprietor. This allegation is not backed up by experimental evidence, either.

2.3.3 Moreover, these results concern the same improvements as the technical effects achieved which are featured in the original (parent) application and referred to in the patent. These effects result in a *higher yield* of the desired product trans-1,3,3,3-tetrafluoropropene (see also page 2, lines 25 to 28 of the parent application). The improvements and resulting effects already featured in the (parent) application are the same as determined with regard to the aforementioned embodiments of D2/D2a. It also has to be kept in mind that not each and every item of prior art is at an applicant's disposition on the filing date of an application. Consequently, the data provided by the proprietor after the filing date of the application as filed support the same technical effects encompassed by the technical teaching of the parent application and embodied by the same originally disclosed invention, as stipulated by G 2/21. In this regard, the scenario underlying the case in hand differs from that encountered in T 681/21, cited by the opponent. In that decision, the patent proprietor had attempted to rely

on a synergistic technical effect between two components that was not disclosed in the application as filed.

2.3.4 What also has to be assessed is the issue of whether the purported technical effect can be credibly achieved across the full claimed scope. It is noted that claim 1 does not require that the catalyst "is" fluorinated Cr_2O_3 in bulk form, but that it "comprises" it. Likewise, according to the proprietor when discussing the amendments to claim 1, claim 1 encompasses embodiments in which the catalyst is blended with other catalysts. Therefore, the catalyst used in the process in claim 1 as granted can comprise further constituents. This was also stressed by the opponent, stating that only a single fluorinated Cr_2O_3 in bulk form had been tested by the patent proprietor. The opponent added that it could not be agreed that an effect could have been credibly demonstrated if this effect could be significantly diminished by the possible presence of further components in the catalyst.

2.3.5 Whilst those additional constituents could theoretically affect the activity of the chromium catalyst, claim 1 has to be construed with a mind willing to understand. In this context, claim 1 has to be construed such that the catalysts comprised active fluorinated Cr_2O_3 in bulk form on their surface, which is thus accessible for catalytic reaction. Variants in which the latter material is merely buried within the core of catalyst particles or which only contains deactivated fluorinated Cr_2O_3 in bulk form are technically nonsensical.

Likewise, even when considering, for example, an embodiment which contains 50% fluorinated Cr_2O_3 in bulk form and 50% binder, the technical effects observed for fluorinated Cr_2O_3 in bulk form would possibly be diluted/diminished, but would not be absent. There would be no reason to suspect that the relative trans/cis-ratio of 1,3,3,3-tetrafluoropropene would be changed.

2.3.6 The opponent has not filed any experimental data that would undermine the technical effects demonstrated in the patent and the supplemental experimental data provided by the patent proprietor, either, nor has it been demonstrated that the aforementioned effects would not have a real impact on an industrial scale.

2.3.7 While the aforementioned technical effects might be reduced or "diluted", there is thus no reason to conclude that these effects could not be observed at least to some extent over the full claimed scope.

2.3.8 It follows that the objective technical problem solved with regard to D2 is that of providing an *improved* process for producing trans-1,3,3,3-tetrafluoropropene from 1,1,1,3,3-pentafluoropropane, as correctly held by the opposition division (see decision under appeal, point 135).

2.4 Obviousness

2.4.1 The opponent submitted that, in view of the problem to be solved as stated above, the skilled person would have applied the teaching of D3 to D2.

In this context, D3 was compatible with the teaching of D2 since D3 refers to supported and bulk fluorinated

chromium oxide catalysts (see column 1, lines 41 to 43 of D3). A skilled person would also be aware that the presence of oxygen aimed to increase the catalyst lifetime, but was not essential for the dehydrofluorination. Moreover, the catalyst lifetime was not linked to reaction yield. Similarly, the examples of D2 had been conducted in the absence of oxygen, and a skilled person would have avoided the use of oxygen due to safety concerns.

Moreover, it was common general knowledge that all heterogeneous catalysts existed either in supported or in bulk form. Chromia catalysts in both bulk and supported forms had been used in reactions changing fluorine distribution of hydrofluorocarbons for decades. This was also supported by documents D23 to D26 (fluorination in the case of these documents). Likewise, example 1 of D3 even used a bulk fluorinated chromia catalyst, which was the preferred catalyst in D3.

Starting from D2, the nature of the catalyst would have been the first variable to investigate. The most obvious modification to try would have been the form of the catalyst. A skilled person starting from D2 and faced with the objective technical problem would also have expected to increase the conversion and product yield when using a catalyst having a higher amount of chromia and would thus have substituted the activated-carbon supported fluorinated chromia with fluorinated chromia in bulk form.

Hence, the subject-matter of claim 1 was obvious to a skilled person in view of D2, optionally in combination with document D3. Similar considerations applied when applying the teaching of document D6 to D2. D6 also

taught dehydrofluorinating 1,1,1,3,3-pentafluoropropane in the presence of a catalyst which could be fluorinated chromia. In seeking to provide a modestly improved process for producing 1,3,3,3-tetrafluoropropene, a skilled person would have modified the catalyst used in the process in D2 with fluorinated chromia in bulk form based on the teaching of D6 and would thus have arrived at the scope of claim 1 in an obvious way.

2.4.2 The board does not agree. There is no evidence that the skilled person would have expected a fluorinated chromia bulk catalyst to have higher activity than fluorinated chromia supported on activated carbon, as used in D2. This is all the more true since a large part of the chromia would be present deep in the bulk catalyst and would thus not be accessible for the catalytic reaction. Moreover, activated carbon, which is present as the support material in the fluorinated chromia catalysts used in the examples of D2, is itself featured in D2 as a catalyst for the dehydrofluorination. This point was correctly noted by the patent proprietor.

The board thus concludes that a skilled person starting from D2 would not have inferred from the secondary documents and/or common general knowledge adduced by the opponent, in particular D3 or D6 as secondary teaching, that the use of fluorinated chromia in bulk form, rather than supported on activated carbon, in the dehydrofluorination would have given rise to the aforementioned beneficial technical effects and solved the objective technical problem posed.

2.5 Therefore, the subject-matter of claim 1 is not obvious to a skilled person and involves an inventive step. The

ground for opposition under Article 100(a) in conjunction with Article 56 EPC does not prejudice the maintenance of the patent as granted.

3. Amendments - auxiliary requests 1 to 18

3.1 The objections raised with respect to claim 4 of the main request apply equally to the corresponding claim 4 of auxiliary requests 2, 4, 6, 8 and 10.

3.2 Regarding claim 10 of auxiliary requests 1 to 11 and the corresponding claim 5 of auxiliary requests 12 to 17, the above considerations in points 1.4.3 and 1.4.4 in relation to claim 10 of the main request apply equally.

This finding also applies to claim 10 of auxiliary requests 2, 3, 6 to 8, 10 and 11, and accordingly to claim 5 of auxiliary requests 13, 15 and 17. Each claim 10 (or the corresponding claim 5 of auxiliary requests 13, 15 and 17) of those claim requests also comprises the back-reference to any preceding claim that was absent from independent claim 10 as originally filed and thus feature combinations that were not disclosed in the application as filed.

3.3 Hence, the subject-matter of these claims does not meet the requirements of Articles 76(1) and 123(2) EPC. Auxiliary requests 1 to 17 are thus not allowable.

3.4 By contrast, the subject-matter of auxiliary request 18 meets the requirements of both Articles 76(1) and 123(2) EPC, with claim 1 being identical to claim 1 of the main request (see point 1.2 above), claim 4 being reversed to claim 4 as originally filed, and claim 10 of the patent as granted being deleted.

4. Inventive step – auxiliary request 18

Claim 1 corresponds to claim 1 as granted. Consequently, the reasons set out above in point 2 apply equally. The subject-matter of claim 1 thus involves an inventive step and meets the requirement of Article 56 EPC. Dependent claims 2 to 9 include the feature combination of claim 1, which is considered to involve an inventive step.

5. As auxiliary request 18 corresponds to the request which the opposition division held allowable, both appeals are to be dismissed.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar: The Chairman:

K. Götz-Wein A. Haderlein

Decision electronically authenticated