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**Datasheet for the decision  
of 10 October 2024**

**Case Number:** T 0462/22 - 3.3.06

**Application Number:** 10806914.7

**Publication Number:** 2461904

**IPC:** B01J23/38, B01J23/70,  
B01J37/02, C07C17/25, C07C19/08

**Language of the proceedings:** EN

**Title of invention:**  
HYDROGENATION CATALYST

**Patent Proprietor:**  
Honeywell International Inc.

**Opponent:**  
ARKEMA FRANCE

**Headword:**  
Hydrogenation/Honeywell

**Relevant legal provisions:**  
RPBA 2020 Art. 12(4)  
EPC Art. 123(2), 54, 56

**Keyword:**

Amendment to case - admitted (yes)

Amendments - deletion of features (yes) - extension beyond the content of the application as filed (no)

Novelty - (yes)

Inventive step - (yes)

**Decisions cited:**

T 0332/87, T 0653/07, T 1239/08, T 0783/09, T 1075/12,

T 1506/13, T 0116/18, T 1259/17

**Catchword:**



**Beschwerdekammern**

**Boards of Appeal**

**Chambres de recours**

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Case Number: T 0462/22 - 3.3.06

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.06**  
**of 10 October 2024**

**Appellant:** Honeywell International Inc.  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 10 December  
2021 revoking European patent No. 2461904  
pursuant to Article 101(3) (b) EPC.**

**Composition of the Board:**

**Chairman** J.-M. Schwaller  
**Members:** S. Arrojo  
J. Hoppe

## Summary of Facts and Submissions

- I. The appeal is from the proprietor against the decision of the opposition division to revoke European patent No. 2 461 904.
- II. In the appealed decision, the main request was not admitted under Rule 80 EPC; claim 1 of auxiliary requests 1, 3, 9 and 11 was held not to be novel over **D3 (WO 2010/142877 A1)**, **D4 (WO 2010/142878 A1)** or **D5 (WO 2011/010024 A1)**; claims 4 and/or 5 of auxiliary requests 2, 4, 6, 8, 10 and 12 were held to extend beyond the content of the application as filed; claim 1 of auxiliary requests 5 and 7 was held not inventive in view of **D11 (US 2007/0123741 A1)** combined with **D14 (Tajima et al., Electrochimica Acta, 1959, Vol. 1, 205-216)**; claim 1 of auxiliary requests 11 and 13 was held not inventive in view of the combination of **D10 (EP 0644173 A1)** with D11 and D14.
- III. In its grounds of appeal filed on 19 April 2022, the appellant requested that the above decision be set aside and the patent be maintained on the basis of the main request filed therewith or, as an auxiliary measure, of any one of auxiliary requests 1 to 7 also filed with the grounds of appeal.
- IV. The subject-matter of claim 1 according to the main request reads as follows:
- "1. A method for hydrogenating a compound comprising: contacting a reactant comprising a fluoroolefin, with a supported hydrogenation catalyst under reaction conditions effective to form a reaction product*

*comprising a hydrogenated derivative of said olefin;  
the method comprising the steps of:*

*a) adding hydrogen and a fluoroolefin to a reaction vessel containing the hydrogenation catalyst; and  
b) reacting said fluoroolefin with hydrogen over said hydrogenation catalyst to produce a hydrofluorocarbon;  
wherein said fluoroolefin reactant and said hydrofluorocarbon reaction product are selected from the following combinations:*

*1,1,2,3,3,3-hexafluoropropene (FO-1216; HFP) and 1,1,1,2,3,3-hexafluoropropane (HFC-236ea);  
1,2,3,3,3-pentafluoropropene (HFO-1225ye) and 1,1,1,2,3-pentafluoropropane (HFC-245eb);  
1,1,3,3,3-pentafluoropropene (HFO-1225zc) and 1,1,1,3,3-pentafluoropropane (HFC-245fa);  
1,3,3,3-tetrafluoropropene (HFO-1234ze) and 1,1,1,3-tetrafluoropropane (HFC-254fb); and  
2,3,3,3-tetrafluoropropene (HFO-1234yf) and 1,1,1,2-tetrafluoropropane (HFC-254eb);*

*and wherein said supported hydrogenation catalyst comprises:*

*a) 90 to 99.9 weight % of alumina, wherein said alumina is at least 90 weight % alpha-alumina; and  
b) 0.1 to 10 weight % of at least one zero-valent metal, wherein said at least one zero-valent metal is selected from the group consisting of Ru, Pt, Rh and Ir."*

V. In its reply, the opponent and respondent requested that the appeal be dismissed and the revocation of the patent be confirmed, because claim 1 of the main request was neither novel in view of D3, D4 or D5, nor inventive in view of D10 combined with D14, **D8 (US 4,762,956)** or **D9 (US 2006/0217579 A1)**. Furthermore its subject-matter extended beyond the content of the application as filed.

- VI. In its preliminary opinion, the board was of the view that the main request should be admitted and it concluded that said request appeared to meet the requirements of Article 123(2) EPC. The main arguments relating to novelty and inventive step were also discussed.
- VII. In a submission dated 27 March 2024, the respondent filed the new document D17 to further support the inventive step argumentation.
- VIII. With a submission dated 26 September 2024, the appellant requested that D17 not be admitted into the appeal proceedings and it argued against the relevance of the newly filed evidence.
- IX. At the oral proceedings, which took place on 10 October 2024 by videoconference, the parties confirmed the requests as set out above.

### **Reasons for the Decision**

1. Main request - Admittance
  - 1.1 This request was filed for the first time at the appeal stage, so it constitutes an amendment of the appellant's case, whose admittance is governed by Article 12(4) RPBA.
  - 1.2 The claims at issue correspond to those of the main request filed before the opposition division - except that claims 4 and 6 have been deleted - which request was not admitted under Rule 80 EPC because claim 9 as granted had been deleted, but this amendment was not occasioned by a ground for opposition. The division also noted that other granted claims which had been

previously dependent on claim 9 had not been deleted, which the board understands as an indication that admitting this request would have led to further objections under Article 123(2) EPC.

1.3 The board notes that the dependent claims potentially incompatible with the deletion of claim 9 are no longer defined in the main request at issue. The board has also no concern under Rule 80 EPC, as it is apparent that the amendments to the claims as granted are intended to overcome the objections under Article 123(2) EPC.

1.4 The board also notes that the main request at issue is identical to auxiliary request 1 at issue (which corresponds to auxiliary request 1 discussed in the decision under appeal) with the sole difference that it includes a dependent claim 4. This does not change the subject of the proceedings, as this claim corresponds to claim 11 as granted and is also defined as part of claim 1 of auxiliary request 2 at issue. Admitting this request will also not affect procedural economy, as the sole difference with respect to auxiliary request 1 (i.e. the presence of dependent claim 4) does not play any role in the discussion of patentability.

1.5 In view of the above considerations and as the respondent did not contest the admittance of this request, the board confirms its preliminary opinion to admit the main request into the appeal proceedings under Article 12(4) RPBA.

2. Main request - Article 123(2) EPC

2.1 The opponent argued that there was no basis in the application as filed for defining the specific amounts

of alumina and zero-valent metal in the catalyst, and of  $\alpha$ -alumina in the alumina. Although these features were disclosed in the application as filed (see claim 1; page 3, lines 8-12), they were described as part of a generic 'composition' with no direct link to the hydrogenation process in claim 1. In fact, there was not even a direct and unambiguous indication that such composition was a supported catalyst rather than some other product such as an intermediate composition. This latter interpretation was consistent with the reference to several process steps and corresponding intermediate products (see references to 'powders', 'slurries', 'pellets', etc. obtained as intermediate products in the process described on pages 3 and 4 of the description as filed).

2.2 The opponent further argued that the process in claim 8 as filed, on which present claim 1 was based, was not originally dependent on claim 1 as filed. In addition, page 5 of the description as filed indicated that the amount of metal was 0.1% to 5%, and not 0.1% to 10% as defined in claim 1 at issue. In summary, the subject matter of claim 1 at issue was based on an arbitrary combination of features from various independent embodiments of the application as filed.

2.3 At the oral proceedings, it was further discussed whether the deletion of some of the metals from the original list of zero-valent metals defined in claim 1 as filed gave rise to an extension of the scope of protection. A first question was raised as to whether the deletion of several of these metals amounted to an unallowable arbitrary selection of multiple elements from a list, particularly considering that one of the deleted metals (i.e. Pd) was the most preferred and the only exemplified alternative. A second question was



raised as to whether there would be a basis for the shortened list of metals in combination with the other amendments to claim 1. In this respect, the opponent indicated that claim 1 at issue added information because shortening the list of alternative metals implied that the original restriction on the concentration of the deleted metals did no longer apply, so that the invention now covered embodiments in which these metals could be present in concentrations falling outside of the originally claimed range.

2.4 The board has concluded that the subject-matter of claim 1 does not extend beyond the content of the application as originally filed for the following reasons:

2.4.1 It is apparent from several passages of the application as filed that the composition defined in original claim 1 is, in fact, a supported catalyst. As pointed out by the proprietor, the first paragraph on page 1 indicates that "the invention relates to supported catalysts for hydrogenating olefins", and the section "summary of the invention" on page 3 begins with a passage that (again) hints that the invention relates to a metal catalyst supported on  $\alpha$ -alumina, followed by a second paragraph introduced with the expression 'accordingly' (which establishes a link with the content of the previous paragraph) describing a composition having the characteristics defined in claim 1 at issue (i.e. 90-99.9 wt.% alumina, 90 wt.%  $\alpha$ -alumina in the alumina, a list of zero-valent metals and an amount of 0.1 to 10 wt.% of this zero-valent metal in the catalyst). In the third paragraph, there is again an explicit reference to the invention being a supported hydrogenation catalyst with an amount of 0.1 to 10 wt.% of a zero-valent metal, the same amount that the preceding

paragraph associates with the 'composition'. This is confirmed in the detailed description of the invention on page 5, lines 9-16, which again associates the range of 0.1-10 wt.% of a zero-valent metal with a supported catalyst (the 0.1-5 wt.% mentioned by the opponent is actually a subsequently described preferred range linked to the sub-list of noble metals). It is therefore apparent that the first three paragraphs on page 3 refer to different aspects of the same product, namely a metal catalyst supported on  $\alpha$ -alumina.

2.4.2 Although the following passages on pages 3 and 4 (see last paragraph on page 3 ff.) describe a method by which intermediate products (such as a slurry, paste, solvent-free powder, calcined powder and pellets) are obtained, it is apparent that these products (which are briefly listed as part of the method) are not compositions according to the invention. This is confirmed in claim 5 as filed, which defines that the method for preparing the catalyst comprises a final step d) that leads to the formation of an 'activated supported catalyst' with the features defined in claim 1 at issue (corresponding to those of the 'composition' in claim 1 as filed).

2.4.3 Furthermore, it is clear from page 1, lines 6-7 of the application as filed that the supported catalysts of the invention are intended to be used for the hydrogenation of fluoroolefins, in particular those listed in Table 1 (see page 12), which correspond to those defined in claim 1 at issue. The board has therefore no doubt that there is a direct link between the 'composition' and the hydrogenation method in claims 1 and 8 as filed.

2.4.4 The board also sees no problem under Article 123(2) EPC with the deletion of 9 out of the 13 originally defined zero-valent metals from the list defined in claim 1 as filed. Deletions of elements from a single list are generally considered to represent an allowable limitation of the scope of protection, as long as said elements are originally presented as alternatives. Even if, as in some decisions (see e.g. T 1506/13, Reasons 4), the deletion was held to be equivalent to multiple selections from the non-deleted elements from identical lists, an objection under Article 123(2) EPC would only be justified if the deletions resulted in the singling out of a hitherto not specifically mentioned individual compound or group of compounds (see T 1506/13, Reasons 4.2 and T 1075/12 Reasons 2.5). However, this is not the case in claim 1 at issue, as the remaining zero-valent metals in the list do not form a separate group with any particular significance, but simply a more restricted version of the original list of alternatives.

2.4.5 As to the questions whether

- i) the deletion of the most preferred metal (i.e. Pd) would extend the subject-matter beyond what was originally disclosed,
- ii) the new claim would impose less restrictions in terms of the amounts of those metals that had been removed from the list, the board firstly sees no reason to treat the deletion of the most preferred metal differently from the deletion of any other alternative when assessing whether the subject-matter has been broadened beyond the disclosure of the application as filed. If the deletion of an element from a list of alternatives narrows the claimed subject-matter according to the above assessment, it is normally irrelevant whether the element is more or less

preferred, because the resulting (narrower) subject-matter does not confront the skilled person with new information.

The board does also not see how the deletion of zero-valent metals from the original list would lead to the broadening of the subject-matter as a result of less restrictions being imposed on the concentration of the metals which are no longer part of the list. As argued by the appellant, the feature "*0.1 to 10 wt.%*" in claim 1 as filed concerns the "*at least one zero-valent metal*" from the list of metals and is part of a composition "*comprising*" at least one of those metals. It follows that the only requirement in original claim 1 is that at least one metal in the list has a concentration within the claimed range, with no further restriction in terms of the presence and amount of other metals, irrespective of whether those other metals are part of the list or not. The same conclusion applies to claim 1 at issue, which only requires the presence of an amount of 0.1 to 10 wt.% of at least one of the zero-valent metals defined in the (shortened) list. In other words, once at least one of the zero-valent metals in the list is provided in an amount falling within the range of 0.1 to 10 wt.%, neither claim 1 as filed nor claim 1 at issue imposes any restriction in the amounts of other zero-valent metals. The deletion of zero-valent metals from the original list therefore does not lead to an extension of the subject-matter beyond the content of the application as filed.

2.5 In view of the above considerations, the board concludes that the requirements of Article 123(2) EPC are met.

3. Main request - Novelty

For the board, the requirement of novelty under Article 54 EPC is met for the following reasons:

- 3.1 Document D3, prior art under Article 54(3) EPC, discloses (page 2, lines 8-19) a process for hydrogenating fluoroolefins as those defined in claim 1 at issue with a catalyst including Pd or Pt preferably supported on  $\alpha$ -alumina (see page 3, line 27 and page 4, line 6). In a preferred embodiment (see par. bridging pages 3 and 4), the catalyst contains Pd in an amount of 0.05 to 10 wt.%, preferably 0.1 to 5 wt.%. The examples in D3 all refer to a catalyst containing 0.2 wt.% of Pd.
- 3.2 Documents D4 and D5, which are also prior art under Article 54(3) EPC, essentially disclose the same subject-matter as D3, so that the following discussion (referring only to D3) also applies to these documents.
- 3.3 According to the opposition division and the respondent, the subject-matter of claim 1 at issue would not be novel over D3 because, while the preferred embodiments disclosed Pd as zero-valent metal, there was a general disclosure (see page 3, line 27) of alternative embodiments including Pt as zero-valent metal. Arriving at the subject-matter of claim 1 was thus a matter of making a single selection within the list of Pt or Pd, and working with preferred features such as a metal concentration of 0.05 to 10 wt.%, 0.1 to 5 wt.% or 0.2 wt.% as proposed in the passage bridging pages 3-4 and the examples. Arriving at a support material comprising  $\alpha$ -alumina did not involve an additional selection, as this was presented as a preferred aspect of the invention (see page 4, line 6).

- 3.4 Even though in D3 the concentration values were always associated with Pd as the zero-valent metal, the respondent argued that documents should be interpreted in the light of their whole content (T 783/09 was cited in support of this conclusion). Moreover, as concluded in T 332/87 (Reasons 2.2), it was allowable to combine general disclosures with specific embodiments or examples.
- 3.5 The board disagrees that document D3 anticipates the subject-matter of claim 1 at issue for the following reasons:
- 3.5.1 It is not disputed that D3 directly and unambiguously discloses alternative embodiments including Pt or Pd as zero-valent metal. There is also agreement that the Pd concentrations proposed in the embodiments and the examples of D3 fall within the concentration range defined in claim 1 at issue. The board does however not see any direct and unambiguous disclosure (be it explicit or implicit) of the concentrations of Pt as zero-valent metal.
- 3.5.2 The question of whether different disclosures in a given document can be combined ultimately depends on how the information is structured. It is a consistently applied principle that for deciding lack of novelty there must be a direct and unambiguous disclosure in the state of the art which inevitably leads the skilled person to a subject-matter falling within the scope of the claims. Thus, for the examination of novelty, different passages of a document cannot be combined simply because there are no reasons that would prevent a person skilled in the art from doing so, but only if there is a clear indication that would inevitably lead a person skilled in the art to combine them (see

T 1239/08, Reasons 4.5).

- 3.5.3 Even though it is generally accepted that the selection of an alternative from a single list does not establish novelty, the combination of this alternative with a specific embodiment can only be allowed under specific circumstances. In T 332/87, the prior art document disclosed a composition which, according to the general part of the description, could be modified or further developed by incorporating fillers. The explicit indication that fillers could be added to the "copolymers manufactured according to the present invention" was considered to imply that this optional further development applied to all the subsequently described embodiments. Therefore, the board concluded that the document implicitly disclosed a copolymer composition described in a specific embodiment (which did not include a filler), further developed by the addition of a filler as suggested in the general part of the description.
- 3.5.4 As pointed out by the appellant, the key difference in the present case is that the proposed reading of D3 as a whole would not involve a further development of an embodiment, but the substitution of one of its features by an alternative one (i.e. the use of Pt instead of Pd as the zero-valent metal in the relevant specific embodiments). While the concept of 'further development' (used above to explain the situation in T 332/87) implies the addition of a feature presented as a general optional aspect to a specific embodiment, the substitution of a feature in a specific embodiment involves not only the addition of an optional alternative but also the deletion of the feature to be substituted and (most importantly) the creation of new substantive links between the substituted element and

the other features in that embodiment. It is these new links which potentially involve the addition of information since, contrary to the requirement of direct and unambiguous disclosure, this would inevitably require the contribution of the knowledge of the person skilled in the art.

In the present case, the board sees no basis for concluding that the concentration range of 0.05 to 10 wt.% or the value of 0.2 wt.% explicitly associated with Pd in the passage bridging pages 3 and 4 and examples of D3 is directly and unambiguously applicable to other zero-valent metals, as this would inevitably involve incorporating new information into the disclosure of D3, namely that Pt and Pd are similar zero-valent metals which require the same concentration in the catalyst, or at least similar enough to assume that the selected values will fall within the ranges defined in claim 1 at issue. Irrespective of whether this additional information is correct and/or trivial (derivable from common general knowledge), it cannot be equated to a direct and unambiguous (implicit) disclosure. In other words, the conclusion that D3 discloses catalysts containing Pt in concentrations which are only proposed for Pd can only be reached by incorporating information from the common general knowledge and/or the skilled person, which goes against the common practices of the boards in the assessment of novelty.

The board therefore concludes that D3 does not directly and unambiguously anticipate a catalyst comprising 0.1 to 10 wt.% of Pt as defined in claim 1 at issue. The subject-matter of claim 1 is thus novel over D3 (as indicated above, the same reasoning and conclusion applies to D4 and D5).



4. Main request - Inventive Step

For the board the requirements of inventive step (Article 56 EPC) are met for the following reasons.

4.1 Closest prior art

4.1.1 The board considers that any one of D10 or D11 can be used as the starting point for the inventive step assessment:

D10 discloses in embodiment 24 on page 12 a process for the hydrogenation of 1,1,1,2,3-pentafluoropropene to obtain 1,1,1,2,3-pentafluoropropane with a 0.5 wt.% rhodium catalyst on an alumina support, without further specification of the type of alumina used.

D11 discloses in examples 1 and 2 a process for hydrogenating 1,2,3,3,3-pentafluoropropene to 1,1,1,2,3-pentafluoropropane with a 1 wt.% Pd catalyst supported on mesh carbon.

4.1.2 As agreed by the parties, neither D10 nor D11 directly and unambiguously disclose an  $\alpha$ -alumina support as defined in claim 1 at issue. Although it has been discussed whether the "alumina" mentioned in embodiment 24 of D10 should be considered to be alumina (in general) or  $\gamma$ -alumina, this issue is not decisive for the underlying argumentation, as the distinguishing feature of the invention would be the same in both cases, namely that the alumina is  $\alpha$ -alumina.

4.2 Problem solved by the invention

4.2.1 According to the patent (see pars. [0004] and [0006]), catalytic supports with high specific surface area such

as  $\gamma$ -alumina are normally preferred over those with lower ones such as  $\alpha$ -alumina. In processes for hydrogenating fluoroolefins, it has been observed that small amounts of HF were formed and attack the (conventionally used)  $\gamma$ -alumina structures, thus leading to deactivation of the catalyst.

According to the patent (see par. [0008]), it was unexpectedly found that metal catalysts supported on  $\alpha$ -alumina provide a solution to the above problem, ensuring a more stable long-term activity for the hydrogenation of fluoroolefins when compared to transition aluminas such as  $\gamma$ -alumina. To substantiate this improvement, the patent provides examples 1 to 3 (see pars. [0029] to [0032]), which compare the long-term performance of Pd catalysts supported on  $\alpha$ -alumina with that of Pd supported on  $\gamma$ -alumina. In particular, example 1 compares Pd-catalysts supported on  $\gamma$ -alumina and  $\alpha$ -alumina and concludes that the latter is significantly more stable than the former (see also figure 1). Examples 2 and 3 test hydrogenation processes of different fluoroolefins on  $\alpha$ -alumina supported Pd-catalysts and conclude that the catalyst maintains its activity even after 800 hours of operation.

4.2.2 The respondent argued that there was no evidence that a specific technical effect was achieved with the catalysts defined in claim 1 at issue with respect to those of the closest prior art. In particular, since Pd was not part of the list of zero-valent metals defined in claim 1 at issue, none of the examples of the patent fell within the scope of the claims, as they all included Pd as the only zero-valent metal. Therefore, the results in the tests shown in figure 1 of the patent could not be considered to demonstrate that the

invention would achieve the effect of improving the long-term stability of the catalyst over the whole claimed range. The problem solved was thus to provide an alternative process.

4.2.3 The appellant argued that, as indicated in pars. [0006] and [0008] of the patent, the catalytic deactivation observed in the hydrogenation of fluoroolefins was caused by an HF attack of the supporting material and that the zero-valent metal did not play any relevant role in this process. The appellant further argued that it was in any case the respondent who carried the burden of proof to demonstrate that the results observed in the patent would not be achieved with other zero-valent metals.

4.2.4 The respondent argued that the newly filed D17 explicitly indicated that catalyst deactivation in Pd and Pt supported catalysts was a function of both the zero-valent metal and the support material. It was thus apparent that the results obtained in the examples of the patent could not be used to demonstrate that the invention would achieve the effect of improving the long-term catalytic performance. The respondent further argued that the observations made in pars. [0004] or [0006] of the patent were mere allegations and that each party should carry the burden of proof to provide evidence in support of their allegations.

4.2.5 The board first notes that the examples of the patent show that the catalytic conversion dramatically declines after about 600 hours of operation (see also figure 1). This might be attributed, as argued by the appellant, to the observed deactivation by the produced HF attacking the support material, as it is clear that there is no slow gradual decrease but a sudden decline,

which is coherent with the alleged structural damage of the support material caused by the HF attack.

Even though, as expressed in the preliminary opinion, the absence of examples falling within the scope of the invention is problematic, looking at the overall body of evidence, the board has concluded that the technical effect of the invention has been sufficiently proven. The board agrees in particular with the respondent that where the scope of the claimed composition is broader than that of the specific examples in the patent, the burden of proof that the alleged advantageous effects mentioned in the patent can be achieved over the whole breadth of the claim rests upon the patent proprietor (see T 1259/17, Reasons 4.5.2; T 653/07, Reasons 5.1.7). This however does not mean that the proprietor has to provide evidence for every possible combination covered by the breadth of the claim. Instead, suitable and reasonable examples in the patent might provide a factual presumption for an effect being achieved over the whole scope (which needs to be rebutted by the opponent) at least as long as the skilled person would not have legitimate reasons to doubt that the effect would be achieved over the whole scope. This is the case when the compositions used in the examples are not so different chemically and structurally that a different behaviour would be expected, and the effect is not inconsistent with common general knowledge (see T 116/18 of 11 October 2021, Reasons 12.5.1 and T 116/18 of 28 July 2023, Reasons 17.4.1, 22.1).

In the present case, the patent explicitly states (par. [0006]) that the deactivation of the catalyst is caused by the formation of HF and its attack on the structure of the support material. This is not just an assertion, as the respondent argues, but an explanation that is

not only technically plausible but also supported by the results in the examples of the patent. Therefore, even if the Pd-containing catalysts used in the examples do not reflect every aspect of the invention, they are considered to be sufficiently close to support the hypothesis set out in par. [0006], since they compare the behaviour of the catalytic supports during the hydrogenation of fluoroolefins. In other words, since the examples include all the features which, according to the patent itself, are necessary to illustrate the underlying problem, and since they differ (from the invention) only in the use of a specific zero-valent metal which is known to have the same function and a similar performance as those defined in the claims, a person skilled in the art would have no legitimate reason to doubt that the effect would be achieved over the whole range of the claims. Therefore, the board sees no reason to doubt that the observations and results in these examples are also achieved for the catalysts defined in claim 1 at issue.

As pointed out by the appellant, this conclusion is in line with the discussion in T 116/18 of 28 July 2023 (Reasons 17.4-17.5) which was also referred to by the respondent. In this decision it was concluded that the effects observed in an example may be taken into account to assess the problem being solved, even where its features do not fall within the scope of the claim, as long as the features are similar enough to make this assumption technically credible and the other party does not provide suitable counter-evidence to prove that this assumption would not be reasonable. In the present case, both conditions are fulfilled because, as explained above, it is technically credible that the results in the examples of the patent would also be

obtained with other zero-valent metals, and the respondent has not filed any counter-evidence to sustain its allegations.

4.2.6 The board also notes that the respondent has not provided convincing evidence as to why the skilled person would have legitimate reason to doubt that the results in the examples would also apply to the catalysts defined in claim 1 at issue. Document D17 is not considered to be relevant for the underlying discussion, because the mechanisms therein are clearly different from those described in the patent. To begin with, this document does not concern the hydrogenation of fluoroolefins or any process which could lead to the formation of HF. The document itself indicates (see abstract and page 319, right col.) that the deactivation problem addressed therein is caused by coke deposition during vegetable oil hydrogenation. Moreover, while in D17 (see figure 1) there is a gradual deactivation from the beginning of the operation which progressively reduces the activity of the catalyst to reach a value of around 50% after only 4 hours, the catalytic conversion in the process of the patent remains mostly constant for up to 600 hours and undergoes a sudden decline only after that point in time. These clear differences indicate that the deactivation problems discussed in D17 are different and unrelated to those addressed in the patent. Consequently, there is no reason to conclude that the observations made in D17 would have any relevance in the process according to the invention. Since D17 is not decisive for the underlying discussion, there is no need to decide on the question of its admittance.

4.2.7 The board thus concludes that the examples of the patent provide sufficient evidence that the  $\alpha$ -alumina

prevents or reduces the problem of long-term deactivation occurring in catalytic processes for the hydrogenation of fluoroolefins. The problem solved by the claimed invention is therefore the provision of a method for the hydrogenation of fluoroolefins using a catalyst with an improved long-term performance.

#### 4.3 Non-obviousness of the proposed solution

4.3.1 D14 is a scientific paper relating to the electrochemical passivation of aluminium surfaces. This document teaches (see abstract and page 208) that the formation of a layer of  $\alpha$ -alumina on the aluminium metal reduces corrosion in the presence of certain corrosive substances such as HF.

4.3.2 The opposition division concluded that when starting from D10 or D11 the use of  $\alpha$ -alumina as catalytic support would be an obvious consideration in view of D14. In particular, since D14 taught that substituting  $\gamma$ -alumina with  $\alpha$ -alumina would give rise to an improved resistance to hydrogen fluoride, it would be obvious to contemplate using the latter to solve the problem of finding an alternative catalyst support with an improved resistance in corrosive environments containing HF.

4.3.3 The respondent further argued that the use of an  $\alpha$ -alumina supported catalyst in hydrogenation reactions was known from D8 or D9. In particular, D8 explicitly taught (see col. 2, lines 10-15 and 33-38; col.6, lines 43-46) that the use of  $\alpha$ -alumina as support material reduced the inactivation of the catalyst and extended its life time. Document D9 taught (see par. [0014]) that  $\alpha$ -alumina supports were, in general, a preferred option in hydrogenation reactions.

4.3.4 The board cannot accept these arguments, and it does in particular not see why a skilled person starting from D10 or D11 and seeking solutions to the problem of providing a method for the hydrogenation of fluoroolefins using a catalyst with an improved long-term performance would consider the teachings of any one of D8, D9 or D14 for the following reasons.

D14 relates to a process for the electrochemical passivation of aluminium by anodic oxidation and is therefore not in the same technical field as the invention (or even in a neighbouring field). Furthermore, there is no reference in D14 to the use of the alumina material as a catalytic support. In fact, it is clear that the purpose of the alumina in D14 is completely different from that of the invention, since this document refers to aluminium pieces with a protective  $\alpha$ -alumina film which, in addition to providing resistance to corrosion, is intended to improve the adhesion of paint or varnish due to its porosity (see abstract).

The situation with D14 illustrates the fundamental differences between a skilled person seeking solutions to a technical problem (i.e. the problem-solution approach) and a search carried out by a party (e.g. an opponent) to assess the patentability of a (known) invention: while it is relatively straightforward for the latter to find D14 after reading claim 1, as this would only require a broad search with keywords such as ' $\alpha$ -alumina', 'HF' and 'corrosion', a skilled person looking for a solution to the underlying problem would be significantly more constrained by the lack of information about the invention. In particular, the skilled person not being aware of the information in the patent would not be able to perform a search using



the above cited keywords and would first have to identify aspects that might affect the long-term performance of the catalyst. From this rather broad starting point there would be no obvious motivation to extend the search beyond the relevant technical fields of catalysis, as navigating through all the texts dealing with products or materials that could potentially be used in a hydrogenation catalyst would be an unreasonable burden in itself. In fact, even if a broad search were to be carried out, D14 would only be found if a number of assumptions were made: i) the skilled person would first have to consider improving the long-term catalytic performance by modifying the support material of the catalyst (rather than other parameters or parts of the catalyst); ii) the skilled person would then have to look in particular for documents dealing with the properties of alumina; and iii) the skilled person would have to then focus on problems of stability and corrosion of the support material, in particular in the presence of HF. Since neither D10 nor D11 discuss any of these issues, these assumptions are considered to be unreasonable. Therefore, the board concludes that the teachings in document D14 would not be found or considered when seeking solutions to the underlying technical problem.

It is also not apparent to the board why the teachings in D8 or D9, which do not relate to a process for the hydrogenation of fluoroolefins, would be taken into account for the purpose of solving the underlying technical problem of improving the long-term performance of a catalyst used in a process for the hydrogenation of fluoroolefins. In particular, the fact that D8 proposes using  $\alpha$ -alumina to prevent deactivation caused by the formation of polymers in the hydrogenation of acetylenic or diene impurities does

not lead to the conclusion that this type of catalyst support would also be advantageous for solving the underlying technical problem, which relates to a different type of deactivation occurring within a different technical context (i.e. hydrogenation of fluoroolefins). Similarly, the fact that D9 presents  $\alpha$ -alumina as a preferred support, either in general or for the specific purposes in that document, is irrelevant when seeking solutions to the specific problem of improving the long-term performance of a catalyst used in a method for the hydrogenation of fluoroolefins. The board thus concludes that the content of D8 or D9 would also not be taken into consideration when seeking solutions to the underlying technical problem.

- 4.3.5 All in all, since none of the documents cited by the respondent teaches directly or indirectly that the use of  $\alpha$ -alumina as support material would solve the problem of improving the long-term performance of the catalyst in a process for the hydrogenation of fluoroolefins, the subject-matter of claim 1 at issue is not obvious from the known state of the art when starting from D10 or D11 as the closest prior art.
- 4.4 The board therefore concludes that the invention according to the main request meets the requirements of Article 56 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 based on the claims of the main request filed with the grounds of appeal dated 19 April 2022 and a description to be adapted where appropriate.

The Registrar:

The Chairman:



A. Wille

J.-M. Schwaller

Decision electronically authenticated