

Candidate's Answer – B (Chemistry)

Dear Sirs,

Re: European Patent Application No. XYZ

I refer to your communication pursuant to Article 96(2) EPC and enclose in triplicate an amended set of claims 1 - 14.

1. Basis for the amended claims (Article 123 (2) EPC):

- Claim 1 - original claim 2 and page 3 lines 23-24
- Claim 2 - original claim 3
- Claim 3 - page 3 lines 28-30
- Claim 4 - page 4 lines 1-12
- Claim 5 - page 1 line 27, page 2 line 5-7, page 5 line 11 and original claim 1
- Claim 6 - page 4 line 21 and page 6 lines 9-10
- Claim 7 - page 5 line 16
- Claim 8 - page 5 lines 25-26
- Claim 9 - page 6 lines 1-7
- Claim 10 - page 6 lines 25-26
- Claim 11 - page 6 lines 9-10
- Claim 12 - page 6 line 11
- Claims 13, 14 - page 6 lines 9-10

2. Novelty (Art. 54 EPC) and inventive step (Art. 56 EPC) of the amended claims:

Claim 1 is novel over DI and DII, because both DI and DII disclose a process for preparing fluorinated hydrocarbons in which at least one of X and Y is chlorine, but neither DI nor DII discloses the presence of a base under these circumstances.

Claim 1 is also inventive over DI and DII and a combination of DI and DII for the following reasons. Taking either DI or DII as the closest prior art, the objective problem addressed by claim 1 is how to avoid the formation of chlorinated by-products when using starting compounds of formula (III) where at least one of X and Y is chlorine (see the present application page 3 lines 19 to 24). Neither DI nor DII has even recognised that the processes disclosed suffer from this problem. Chlorinated by-products are admitted to in both DI and DII (see DI lines 13-14 and DII page 1 line 20), but they are not recognised as posing a problem. DI and DII are even further from suggesting the solution to this problem (the presence of a base).

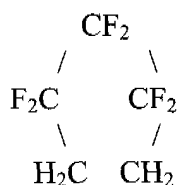
Therefore, claim 1 is inventive over DI and DII, taken separately or in combination.

Claims 2 to 4 are novel and inventive at least by dependency on claim 1.

Claim 5 which in effect claims

$$\begin{array}{ccc} \text{H}_2\text{C} & \text{---} & \text{CH}_2 \\ | & & | \\ \text{F}_2\text{C} & \text{---} & \text{CF}_2 \end{array} \quad \text{is}$$

novel over DI because DI only discloses $\text{F}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CF}_3$ and is novel over DII because DII only discloses



Claim 5 is also inventive over DI and DII, separately as well as in combination for the following reasons. Taking over DI or DII as the closest prior art, the objective problem addressed by claim 5 is the provision of an alternative fluorinated hydrocarbon having a suitable boiling point for the desired applications (see the present application page 5 lines 1-15). Neither DI nor DII have recognized that the compound of claim 5 exists and that it has a boiling point (50-51°C) which is low enough to make it suitable for the applications described in the present application.

Therefore, claim 5 is inventive over DI and DII, taken separately or in combination.

Claim 6 is novel over DI, because although DI discloses one of the compounds of claim 6, DI does not disclose the use as claimed in claim 6. Claim 6 is novel over DII, because although DII discloses the use as claimed in claim 6 (see DII page 1 line 2), DII does not disclose the use as claimed in claim 6 in connection with either one of the compounds as required by claim 6.

Claim 6 is inventive over DI and DII, separately or in combination, for the following reasons. Taking DII as the closest prior art, the objective problem addressed by claim 6 is the provision of an alternative fluorinated hydrocarbon having a suitable boiling point for the desired uses (see the present application page 5 lines 1-15). DII has not recognized that the compounds of claim 6 exist and that they have boiling points (25-26 °C and 50-51 °C) which are low enough to render them suitable for the uses as claimed in claim 6.

With respect to claim 6, it is submitted that DII cannot be combined with DI, because DI does not lie in the technical field of uses of fluorinated hydrocarbons. Furthermore even if DII were to be combined with DI, the skilled person would not arrive at the subject matter claimed in claim 6, because DII and DI very specifically only relate to one compound each, and nothing in DII or DI suggests that the compound of DI could be used in the uses disclosed in DII.

Taking, alternatively, DI as the closest prior art, the objective problem addressed by claim 6 is the provision of uses of the compound of DI. DI has not recognized that the compound it discloses is useful for anything at all. As outlined above, with respect to claim 6 at least, DI and DII cannot be combined. They lie in different technical fields and the skilled person has no incentive to combine them. Furthermore, even if DI were to be combined with DII, the skilled person would not arrive at the subject matter as claimed in claim 6, for the same reasons as outlined above.

Therefore claim 6 is inventive over DI and DII and any combination (DI + DII or DII + D

Claim 7 is novel over DI and DII because neither document mentions azeotropic mixtures of any s

Claim 7 is also inventive over DI and DII and any combination thereof, because nothing in either document suggests the azeotropic mixtures claimed in claim 7, such that the skilled person would not arrive at the subject matter of claim 7.

Claims 8 and 14 are novel and inventive at least by dependency; “dependency” referring to the fact that these claims all incorporate all features of claim 7.

3. Clarity (Article 84 EPC)

It is submitted that all amended claims are clear within the meaning of Article 84 EPC. If the Examining Division considers that this is not the case, specific objections should be raised.

4. Unity (Article 82 EPC):

It is submitted that amended claims 1 to 14 do not lack unity. In particular claims 1 - 6 and claims 7 - 14 relate to one invention only, because the 1,1,2,2,3,3-hexafluorocyclopentane comprised in the azeotropic mixture of claims 7 - 14 can be prepared by a process as claimed in any one of claims 1 to 3. It is noted that according to the Guidelines C-III, 7.7, the benefit of any doubt should be given to the applicant in borderline cases with respect to unity.

Furthermore, as a precautionary note it is noted that an objection under Rule 86(4) EPC only arises in the case of lack of unity.

5. Communication

In view of the objection raised in paragraph 1, the claims of the present application have been amended. The amended claims are believed to be novel as outlined above in paragraph 2.

Regarding paragraph 2, amended claims have been filed, which are believed to comply with the requirements of the EPC, in particular see paragraph 1 above for basis in the application as filed, paragraph 2 above for novelty and inventive step, paragraph 3 above for clarity, and paragraph 4 above for unity.

With respect to paragraph 3 of your communication, I refer you to paragraph 2 above. Regarding your paragraph 4, all independent claims are believed to recite all essential features of the invention.

Regarding your paragraph 5, I refer you to paragraph 1 above.

With respect to your paragraph 6, it is noted that the description may need amendment to bring it into conformity with the amended claims.

7. Summation

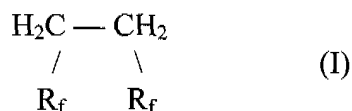
The applicant reserves the right to file a divisional application.

It is submitted that the present invention as defined by the amended claims is novel and inventive for the reasons outlined above. The application is therefore allowable. If any matters remain outstanding, I should be pleased to discuss them with the Examiner by telephone. If the Examiner is unwilling to do so, or to issue a further communication under Art. 96(2) EPC, I hereby request oral proceedings pursuant to Article 116 EPC as a precautionary measure.

Yours truly,

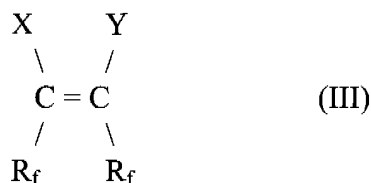
(Signature)

1. A process for preparing fluorinated hydrocarbons of the formula:



Wherein R_f is a monovalent fluorinated hydrocarbon radical, or the two R_f groups taken together are a divalent fluorinated hydrocarbon radical,

the process comprising catalytically hydrogenating an olefinic compound of the formula:



wherein

X is hydrogen, fluorine, chlorine, or bromine;

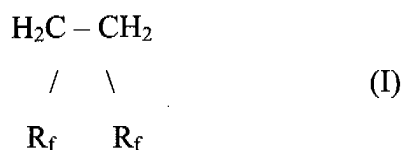
Y is fluorine, chlorine, or bromine; and

R_f is defined as above,

characterised in that the process is conducted in the presence of a base, if X or Y or both are chlorine.

2. The process of claim 1, wherein the olefinic compound of formula (III) is [insert compounds of original claim 3].
3. The process of claim 1 or 2, wherein the base is potassium hydroxide, sodium hydroxide, sodium bicarbonate (NaHCO_3), magnesium hydroxide, triethylamine or pyridine.
4. The process of any one of claims 1 to 3, wherein the base is used in an amount of 1.8 to 3 equivalents per mol of the compound of formula (III).

5. A fluorinated hydrocarbon of the formula:



wherein both R_f taken together are a divalent radical Rf_- of the formula $-\text{CF}_2-\text{CF}_2-$.

6. Use of 1,1,1,4,4,4-hexafluorobutane or 1,1,2,2-tetrafluorocyclobutane in cleaning fluid or as working fluid for heat pumps.
7. An azeotropic mixture comprising 1,1,2,2,3,3-hexafluorocyclopentane and a C_1 to C_4 alkanol.
8. The azeotropic mixture of claim 7, wherein the alkanol is methanol or ethanol.
9. The azeotropic mixture of claim 8, comprising
- (i) 65-73 weight % 1,1,2,2,3,3-hexafluorocyclopentane and 35-27 weight % methanol, or
 - (ii) 71-79 weight % 1,1,2,2,3,3-hexafluorocyclopentane and 29-21 weight % ethanol.
10. A process for preparing the azeotropic mixture of any one of claims 7 to 9, comprising the steps of weighing out the desired amount of each component and thereafter combining them in an appropriate container.
11. Use of the azeotropic mixture of any one of claims 7 to 9 in cleaning fluid or as working fluid for heat pumps.
12. The use of claim 11, wherein the azeotropic mixture is used to remove flux and flux residues from printed circuit boards.
13. A cleaning fluid comprising an azeotropic mixture as claimed in any one of claims 7 to 9.
14. A working fluid comprising an azeotropic mixture as claimed in any one of claims 7 to 9.

Memo to client

- Original claims 1 to 3 had to be amended, because they lacked novelty over DI and DII. Both DI and DII disclose a compound each, falling within the scope of original claim 1 (DI – each $R_f = -CF_3$, DII – both $R_f = -CF_2-CF_2-CF_2-$).

Both DI and DII disclose a hydrogenation process falling within the scope of original claim 2 (DI – lines 11-13, DII – page 1 lines 13-15).

Both DI and DII disclose a hydrogenation process falling within the scope of original claim 3 (DI – starting materials 1a and 1b, DII – starting material 1,2-dichloro-3,3,4,4,5,5-hexafluorocyclopentane as per DII is the same as 3,3,4,4,5,5-hexafluoro-1,2-dichloro-cyclopentane as per the present application).

Thus amendments had to be made. The amended claims cover as much subject matter as possible.

- If the EPO finds that the amended claims relate to two inventions (lack of unity contrary to Article 82 EPC), namely fluorinated hydrocarbons, their preparation and uses (claims 1 to 6) on the one hand and azeotropic mixtures, their preparation, uses and compositions (claims 7 to 14) on the other hand, the EPO will not only raise an objection under Article 82 EPC, but also under Rule 86(4) EPC, because claims 7 to 14 may well be considered to relate to unsearched subject matter, since the original claims did not cover azeotropic mixtures at all. In this case, we will have to file a divisional application under Article 76 EPC and pay for a further search.

Even if the EPO does not raise an objection of lack of unity, a further search may be required, which the EPO will have to prepare as outlined in the Guidelines C-VI, 5.2(ii).

- Further, I note that claim 10 seems trivial.
- Please let me know if you are willing to file a divisional on claims 7 - 14 if required.

Note to the EOJ Examiner

I realise that my arguments of unity are very weak, and I would file a divisional on claims 7 - 14 as soon as requested by the EPO. I have not yet filed a divisional because I do not have the client's permission to do so, and the response as filed will at least give me enough time to ask the client. If I was aware of the client wishing speedy grant, I would have filed claims 7 - 14 as a divisional straight away, because there is probably lack of unity.