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**Datasheet for the decision  
of 16 April 2024**

**Case Number:** T 1220/22 - 3.3.09

**Application Number:** 16700595.8

**Publication Number:** 3245242

**IPC:** C08J9/00, C08J9/14, C08J9/18

**Language of the proceedings:** EN

**Title of invention:**  
USE OF A MINERAL HAVING PEROVSKITE STRUCTURE IN VINYL AROMATIC  
POLYMER FOAM

**Patent Proprietor:**  
Synthos S.A.

**Opponent:**  
versalis S.p.A.

**Headword:**  
Mineral having perovskite structure in vinyl aromatic polymer  
foam/VERSALIS

**Relevant legal provisions:**  
EPC Art. 56, 83, 100(a), 100(b), 111(1)  
RPBA 2020 Art. 11, 13(2)

**Keyword:**

Inventive step - obvious alternative

Grounds for opposition - insufficiency of disclosure (yes)

Sufficiency of disclosure - (no)

Remittal - (no)

**Decisions cited:**

T 0075/11, T 1137/21



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Case Number: T 1220/22 - 3.3.09

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.09**  
**of 16 April 2024**

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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 11 February  
2022 revoking European patent No. 3245242  
pursuant to Article 101(3) (b) EPC.**

**Composition of the Board:**

**Chairman** A. Haderlein  
**Members:** C. Meiners  
N. Obrovski

## Summary of Facts and Submissions

- I. The present decision concerns the appeal filed by the patent proprietor (appellant) against the decision of the opposition division to revoke the patent.
- II. In its decision, the opposition division decided, *inter alia*, that the subject-matter of claim 1 as granted lacked an inventive step in view of document D4 as the closest prior art. Furthermore, it was held that the subject-matter of claim 14 of the first auxiliary request (Claim Set A) also lacked an inventive step in view of document D4. This finding also applied to the corresponding independent claims 13, 12 and 4 of the second to fifth auxiliary requests (Claim Sets B to E) pending at that time. Claim Set B-prime was admitted, but claim 1 of that request was held not to comply with Article 83 EPC. Moreover, the opposition division admitted document D22 into the proceedings.
- III. In its notice of opposition, the opponent had requested revocation of the patent based, *inter alia*, on Article 100(a) EPC, for lack of an inventive step, and on Article 100(b) EPC.
- IV. The following documents are relevant to this decision:
- D4 WO 2010/128369 A1
- D5 Roth R.S., "Classification of perovskite and other  $ABO_3$ -type compounds", Journal of Research of the National Bureau of Standards 58, 1957, 75-88
- D21 Declaration of Dr Filip Kondratowicz, dated 22 October 2019

D22 Expert declaration by Mr Riccardo Felisari, dated  
28 August 2020

D31 Revised version of declaration D21 with annexes,  
dated 26 November 2021

V. *Wording of the relevant claims*

Independent claim 1 as granted reads as follows:

"Use of a mineral of the general formula  $ABX_3$ , A and B being cations and X being anions, wherein the mineral has perovskite crystal structure, in vinyl aromatic polymer foam, wherein the polymer foam further comprises one or more athermanous additives selected from

- a) powder inorganic additive selected from powders of silica and calcium phosphate,
- b) powder carbonaceous additive selected from powders of graphite, carbon black, petroleum coke, graphitized carbon black, graphite oxides, and graphene, and
- c) powder geopolymer and powder geopolymer composite."

Independent claim 15 as granted reads as follows:

"Expandable polymer granulate, comprising one or more propellants, x) mineral of the general formula  $ABX_3$ , A and B being cations and X being anions, wherein the mineral has perovskite crystal structure, and y) polymer of vinyl aromatic monomer and optionally one or more comonomers,  
wherein the expandable polymer granulate further comprises one or more athermanous additives selected from

- a) powder inorganic additive selected from powders of silica and calcium phosphate,
- b) powder carbonaceous additive selected from powders of graphite, carbon black, petroleum coke, graphitized carbon black, graphite oxides, and graphene, and
- c) powder geopolymer and powder geopolymer composite."

Claim 1 of the first auxiliary request (Claim Set A) additionally contains the features of granted claim 2:

"[...], wherein the mineral having perovskite structure is used

- i) for decreasing the thermal conductivity of the vinyl aromatic polymer foam, the decrease being measured in accordance with ISO 8301,
- ii) for increasing the compressive and bending strengths of the vinyl aromatic polymer foam, the increase being measured in accordance with EN 13163, or
- iii) for improving the self-extinguishing properties of the vinyl aromatic polymer foam, the improvement being measured in accordance with EN ISO 11925-2, preferably wherein the improvement of the self-extinguishing properties of the vinyl aromatic polymer foam is measured in accordance with DIN 4102 B1, B2."

Claim 14 of the first auxiliary request (Claim Set A) corresponds to claim 15 as granted.

The second auxiliary request (Claim Set A-prime) differs from the first auxiliary request (Claim

Set A) in that it does not comprise claims directed to granulate.

Claim 1 of the third auxiliary request (Claim Set B) is further limited over that of the first auxiliary request by the amount of the mineral having perovskite structure:

"wherein the amount of mineral having perovskite structure is in a range of from 0.01 to 8 wt.%, based on the vinyl aromatic polymer inclusive of (solid and, if any, liquid) additives, but exclusive of propellant[, and]".

Independent claim 13 of the third auxiliary request is directed to expandable polymer granulate as claimed in granted claim 15 except for the same limitation introduced into claim 1 of that request.

Claim 4 of the fourth auxiliary request (Claim Set B-1) corresponds to claim 13 of the third auxiliary request.

Claim 4 of the fifth auxiliary request (Claim Set B-2) differs from that of the fourth auxiliary request in that graphite and petroleum coke have been deleted from the list of options for carbonaceous additive b).

Independent claim 1 of the sixth auxiliary request (Claim Set B-3) is directed to an expandable polymer granulate as claimed in claim 4 of Claim Set B-1, wherein the lists of the one or more athermanous additives to be selected from options a) to c) have been substituted by the feature "wherein the expandable polymer granulate further comprises carbon black".

Claims 1 and 12 of the seventh auxiliary request (Claim Set C) correspond to claims 1 and 13 of the third auxiliary request (Claim Set B) save for the further limitation that cations A are to be selected from the group consisting of Ca, Sr, Ba, Bi, Ce, Fe and mixtures thereof.

Claim 4 of the eighth auxiliary request (Claim Set D) and claim 4 of the ninth auxiliary request (Claim Set E) are also directed to an expandable polymer granulate and are identical to claim 12 of the seventh auxiliary request.

Claims 1 to 9 making up the tenth auxiliary request (Claim Set B-prime) correspond to claims 1 to 9 of the third auxiliary request (Claim Set B).

Claim 1 of the eleventh auxiliary request (Claim Set D-X) reads as follows:

"Process for the preparation of expandable polymer granulate comprising the following steps:

i) providing continuously to a mass prepolymerization reactor (or the first from a cascade of reactors) a stream of:

- i1) vinyl aromatic monomer and optionally at least one comonomer (preferably p-tert-butylstyrene),
- i2) at least one additive solution, and
- i3) optionally recycled monomer,



ii) continuing polymerization in the prepolymerization reactor or the sequence of cascade reactors,

iii) addition of athermanous fillers (mineral of the general formula  $ABX_3$ , A and B being cations and X being anions, wherein the mineral has perovskite crystal structure and A is selected from the group consisting of Ca, Sr, Ba, Bi, Ce, Fe, and mixtures thereof, and additional athermanous additive) and optionally further additives (preferably flame suppressant),

iv) degassing the polymer,

v) feeding the polymer in molten state into the extruder, preferably directly from the polymerization plant,

vi) optionally adding a flame retardant system including synergist and thermal stabilisers,

vii) injecting blowing agent,

viii) extruding the homogenous polymer blend, and

ix) pelletizing in an underwater pelletizer, so as to obtain the granulate,

wherein the additional athermanous additive is selected from one or more of

a) powder inorganic additive selected from powders of silica and calcium phosphate,

b) powder carbonaceous additive selected from powders of graphite, carbon black, petroleum

coke, graphitized carbon black, graphite oxides, and graphene, and

c) powder geopolymer and powder geopolymer composite, and

wherein the amount of mineral having perovskite structure is in a range of from 0.01 to 8 wt.%, based on the vinyl aromatic polymer inclusive of (solid and, if any, liquid) additives, but exclusive of propellant."

VI. The appellant's arguments, where relevant to the present decision, can be summarised as follows:

- (a) The board should overturn the opposition division's decision to admit document D22 into the proceedings.
- (b) As to inventive step, the distinguishing feature of claim 1 as granted over document D4 as the closest prior art was the addition of  $ABX_3$  minerals having perovskite structure; not just any crystal structure. A combination of a carbonaceous athermanous additive and titanate could only be derived from D4 as a result of making a number of selections.

The technical effect was the improvement of the thermal and mechanical properties of vinyl aromatic foams.

Neither D4 taken alone nor D4 in combination with D5 rendered the claimed solution obvious. Even if the objective technical problem were to be considered to be the provision of an alternative to D4, neither D4 nor D5 taught the use of minerals

having perovskite structure in vinyl aromatic polymer foams. Moreover, D5 was not suitable as proof of common general knowledge.

Consequently, the subject-matter of the claims as granted and of those of the first to tenth auxiliary requests did involve an inventive step.

- (c) As to sufficiency of disclosure, D22 could not undermine the conclusion that the improved thermal and mechanical properties of vinyl aromatic foams as claimed are obtained across the full scope claimed. Experimental details were missing from D22, and therefore it was not possible to ascertain where the opponent's experiments had failed. The patent contained a detailed technical teaching and even examples showing that the effects specified in granted claim 2 were achieved. The patent thus met the requirement of sufficiency of disclosure. This also applied to the subject-matter of the first to tenth auxiliary requests.
- (d) In case the board concludes that the main request is not allowable, the case should be remitted to the department of first instance.
- (e) The eleventh auxiliary request was filed as a reaction to the board's objection under Article 56 EPC with respect to the sixth auxiliary request. However, this objection had not been put forward by the opponent, nor had it been raised in the board's communication under Article 15(1) RPBA. Hence, these circumstances established cogent reasons for taking this request into account.

VII. The opponent's (respondent's) arguments, where relevant to the present decision, can be summarised as follows:

- (a) The board should not overturn the decision to admit D22 into the proceedings.
- (b) The main request lacked an inventive step in view of document D4 alone or in view of D4 in combination with common general knowledge as reflected in document D5. No technical effect could be causally associated with the choice of a specific titanate, namely perovskites, as the distinguishing feature. Choosing a titanate compound from a number of equally likely alternatives did not confer an inventive step. This conclusion also applied to each of the first, third and seventh to ninth auxiliary requests.
- (c) The subject-matter of claim 2 as granted was insufficiently disclosed. D22 showed that not all of the claimed embodiments exhibited the claimed technical effect.
- (d) The eleventh auxiliary request should not be taken into account by the board. This request was directed to subject-matter that had never been the subject of the opposition or appeal proceedings. Moreover, it did not address the objections on file and was not limited to carbon black, unlike the sixth auxiliary request.

VIII. Final requests

The appellant requested that the opposition division's decision be set aside and that the patent be maintained as granted (main request). As an auxiliary measure, the

appellant requested that the case be remitted to the opposition division for further prosecution or that the patent be maintained on the basis of one of the first to tenth auxiliary requests as referred to in the statement of grounds of appeal, or on the basis of the eleventh auxiliary request submitted as Claim Set D-X during the oral proceedings before the board.

The respondent requested that the appeal be dismissed.

## **Reasons for the Decision**

### **Main Request**

#### *1. Inventive step (Article 56 EPC)*

1.1 The patent is concerned with the provision of expandable vinyl aromatic polymer compositions. The polymer foams formed should exhibit decreased thermal conductivity without adversely affecting the foam's flammability and mechanical properties (see paragraphs [0014] and [0015] of the patent).

#### 1.2 Closest prior art

It is common ground that document D4 can be considered to be the closest prior art. The expandable compositions of D4 comprise an athermanous material, selected from coke, graphite and/or carbon black, as is further specified in claim 1 of that document. Preferably, the compositions therein contain 0.15 to 6 wt% of at least one inorganic additive having at least an absorption band between 100 and 20 000  $\text{cm}^{-1}$ . Examples of these additives include titanates, titanium

oxides, talc and calcium carbonate (see, for example, claim 8). The expanded articles are insulating foams said to have improved heat resistance in terms of exposure to solar irradiation, while maintaining good insulating and mechanical properties (see page 5, lines 8 to 14, of D4).

### 1.3 Distinguishing feature

The appellant argued that the subject-matter of claim 1 differed from D4 in the addition/use of an  $ABX_3$  mineral having perovskite structure. This constituted a "double feature", i.e. firstly the use of an inorganic additive/mineral - which was merely an optional component, d), in claim 1 of D4 - and secondly the mineral having perovskite structure. It was clear from the description and claims 1 and 8 that these additives under d) were merely optional components in D4. Hence, choosing the presence of such additives in the compositions of claim 1 of D4 constituted a first selection. A second selection, from the list of inorganic additives under d) in claim 8 was necessary in order to arrive at the presence of titanates (in the granules). This assessment was also in line with the reasoning of decision T 1137/21. Similarly, no disclosure of titanates as inorganic additives under d) was directly and unambiguously derivable from the description of D4.

The board does not agree. Claim 1 of D4 clearly points to a *preferred* range for the inorganic additives under d) of 0.15 to 6 wt% and hence to their *preferred* presence in the granules. Similarly, four out of the five examples in D4 involve the use of the inorganic additives under d) and therefore constitute a pointer to the use of the additives under d). The examples thus

likewise teach that the use of said additives under d) is preferred in D4. Choosing their presence in D4 is thus not a "selection" step from a list of equal alternatives. When starting from the embodiments of claim 1 comprising 0.15 to 6 wt% of an inorganic additive under d), a person skilled in the art will arrive at the specific choice of titanates after performing a single selection from the list of additives under d) as called for in claim 8.

This conclusion can be confirmed by the following hypothetical consideration: if an amendment to claim 1 of D4 had to be considered under Article 123(2) EPC, a limitation of this claim to such embodiments would not create added subject-matter; rather, it would be directly and unambiguously derivable from the teaching of D4.

The board agrees with the appellant that a uniform concept of disclosure should be applied for the assessment of disclosure under Article 123(2) EPC and of establishing the distinguishing feature over the prior art, and in view of the above the board's findings are fully in line with this uniform concept. The case underlying T 1137/21, as referred to by the appellant, relates to a different scenario involving numerous selections from different dependent claims as originally filed, including less preferred choices. The scenario underlying T 1137/21 is thus not comparable to the case at hand.

Consequently, the distinguishing feature of claim 1 is not the use of titanates but the use of a *specific titanate*, namely of one having perovskite crystal structure and the general formula  $ABX_3$ .

- 1.4 Technical effect and objective technical problem
- 1.4.1 As argued by the appellant, Comparative Examples 1, 23, and 34 of the patent, for example, reflect embodiments in accordance with the teaching of D4. Corresponding examples in the patent comprising perovskite do indeed describe foams which have improved compressive strength and bending strength and pass the flammability tests applied (see, for example, Examples 3, 6 and 7 in Table 2).
- 1.4.2 First of all, it is noted that the appellant has not provided any evidence showing that there is an improvement as a result of choosing *specific* titanates, i.e. perovskites, over other titanates. Thus, an improvement starting from the disclosure in D4 relating to titanates has not been rendered credible.
- 1.4.3 Likewise, as discussed in the oral proceedings and as also stated by the parties by referring to Examples 1 and 3 to 5, the examples of D4 feature the use of the inorganic additives under d) together with the carbonaceous athermanous additive specified under a). The inorganic additives under d) are active within the wavelengths ranging from 100 to 20 000  $\text{cm}^{-1}$ , as stipulated in claim 1 of D4.

Thus, the examples of the patent are further away from D4. There is no comparison between the embodiments of claim 1 and embodiments of D4 comprising a carbonaceous athermanous additive selected from coke, graphite or carbon black *and* an inorganic additive under d) as used in the examples of D4 or of a titanate other than perovskite.



1.4.4 The data provided in documents D21/D31 do not reflect the situation encountered in D4. They do not show the effect of adding perovskite material to foamable vinyl aromatic polymer compositions comprising a carbonaceous athermanous material, let alone the effect compared to compositions comprising a carbonaceous athermanous material including other titanates as disclosed in D4.

1.4.5 In the absence of a demonstrated effect that can be attributed to specifically choosing perovskites as the titanates and the additives under d), the resulting *objective technical problem* underlying the subject-matter of claim 1 is to provide *alternative* foamable and foamed vinyl aromatic polymer compositions.

1.5 Obviousness

1.5.1 The appellant argued that D4 did not disclose the structure feature (a titanate having perovskite structure of the general formula  $ABX_3$ ) in individualised form. Hence, contrary to the position of the opposition division, in the appellant's view the case at hand did not relate to a selection invention and thus the case law regarding selection inventions did not apply.

1.5.2 However, if a selection from known titanates is arbitrary, it is irrelevant whether the prior art explicitly discloses the alternative to be chosen or discloses it in a more general term such as "titanates". The board agrees with the assessment that D4 does not disclose titanates having perovskite structure and the general formula  $ABX_3$ . However, D4 generically proposes the use of "titanates" as alternative additional athermanous additives under (d). What counts is whether a skilled person faced with the

problem of providing an alternative would have considered using titanates having perovskite structure with a reasonable expectation of success.

- 1.5.3 In this regard, it was known in 1957, as evidenced by document D5, and hence prior to the priority date of the patent, that titanates can have a perovskite or ilmenite crystal structure. Moreover, six out of the 13 titanates known from D5 (Table 2 on page 78) seem to exhibit perovskite structure. Choosing one of these titanate perovskite-type materials, such as  $\text{CaTiO}_3$ ,  $\text{SrTiO}_3$  or  $\text{BaTiO}_3$ , in an arbitrary manner, and using it as the inorganic additive component under d) in combination with the carbonaceous athermanous additives as called for in claim 1 of D4 does not confer an inventive step; rather, it results in an obvious alternative.
- 1.5.4 The appellant's counter-argument that the use of perovskites in the field concerned of thermally insulating foams had not been reported in the prior art is not persuasive. The board sees no reason why a skilled person aiming at providing said alternatives would not have considered using compounds of the type  $\text{ATiO}_3$  having perovskite structure, which were already known.
- 1.5.5 Moreover, whether the only known crystal structures of titanates were perovskite and ilmenite and whether this formed part of common general knowledge is not decisive. What matters, when assessing the issue of obviousness, is whether perovskite titanates such as  $\text{CaTiO}_3$  were known to the skilled person (seeking to implement the "titanates" teaching in D4) prior to the priority date.

1.5.6 Even if one were to assume that the teaching of D5 does not reflect the common general knowledge at the relevant time of filing of the patent, a skilled person aiming at implementing "titanates" in D4 would have turned to pertinent information sources on titanates, such as D5, and would have established that  $\text{CaTiO}_3$ ,  $\text{SrTiO}_3$  and  $\text{BaTiO}_3$ , for example, were known representatives of titanates. Contrary to the appellant's argument, D5 is thus relevant prior art and would have been taken into account by the skilled person working in the technical field of D4.

1.5.7 Consequently, the subject-matter of claim 1 as granted does not involve an inventive step. Thus, the ground for opposition under Article 100(a) EPC in conjunction with Article 56 EPC, lack of an inventive step, prejudices the maintenance of the patent as granted.

## 2. *Admittance of document D22*

2.1 The appellant requested that the opposition division's decision to admit document D22 into the proceedings be reversed by the board.

2.2 It is established case law that a board of appeal should only overrule the way in which a department of first instance has exercised its discretion when deciding on a particular case if it concludes that it has done so according to the wrong principles, or without taking into account the right principles, or in an unreasonable way, and has thus exceeded the proper limits of its discretion (Case Law of the Boards of Appeal, 10th edition, 2022, IV.C.4.5.2). It is not the function of a board of appeal to review all the facts and circumstances of the case as if it were in the place of the department of first instance in order to

decide whether or not it would have exercised such discretion in the same way (T 75/11). The board considers that the opposition division applied the correct criteria in a reasonable way, after having heard the parties on the matter, and gave the reasons for its decision in writing. Document D22, *inter alia*, was considered *prima facie* relevant to the decision to be taken by the opposition division. The board sees no reason to reverse this admittance decision.

Moreover, document D22 is a document on which the appealed decision is based (Article 12(2) RPBA 2020); the reply to the statement of grounds of appeal specifies document D22 and relies on the content thereof. Document D22 is thus not an amendment to the respondent's case, and the board has no discretionary power to disregard it under Article 12(4) to (6) RPBA 2020.

Thus, D22 forms part of the appeal proceedings.

3. *Sufficiency of disclosure (Article 100(b) EPC)*

3.1 In the decision under appeal, sufficiency of disclosure was assessed on the basis of claim 1 of the sixth auxiliary request pending at that time (corresponding to claim 1 of the tenth auxiliary request on file now). This claim contains the features of granted claim 2 and in addition limits the amount of the mineral having perovskite structure. At the oral proceedings before the board, sufficiency of disclosure was discussed in relation to granted claim 2, which encompasses the subject-matter of claim 1 of the tenth auxiliary request.

3.2 In the case at hand, the respondent has convincingly demonstrated by filing document D22 and corresponding arguments that not all foam compositions falling under the scope of claim 2 show the *desired effects i) to iii)* as recited, *inter alia*, in that claim of the main request.

3.3 The experiments in D22 are accompanied by test protocols, and experimental values for the thermal conductivity and measured mechanical properties are included as well (at similar foam densities, see Tables 3 and 4 of D22). Whether or not the densities of the sample specimens correspond to those determined in the patent is irrelevant in this context. The patent does not seem to require a specific particle size for the titanates either.

3.4 D22 also discloses the particle sizes and amounts as well as the exact type of carbonaceous athermanous agents used (see page 3). Similarly, the identity of the other ingredients and their respective amounts are mentioned in D22.

While there was agreement between the parties that proper dispersion of the ingredients in the polymer is needed to obtain good material properties of the resulting composition, the appellant argued that the results arrived at in D22 were possibly due to poor dispersion.

3.5 The board is not convinced. Whilst the dimensions of the extruder employed in D22 are not described in that document, nor whether a single screw or a twin screw extruder was used, it is mentioned that the expandable polystyrene mixture was finely mixed in a static mixer under temperature control (see lines 1 to 2 on page 4).

Similarly, the aperture diameter of the extruder and dimensions of the extruded beads and test procedures (ISO 8301, DIN 4102 B2 and EN 13163) are described on page 4 of D22. There is no information in the patent that would indicate that the exact extrusion conditions (including the extrusion temperature and dimension of the extruder(s)), such as those employed in the examples of the patent or of D4, would be important in order to obtain the sought material properties and an adequate dispersion of the ingredients.

The indications in D22 that are missing, according to the appellant, in relation to the specific extruder, static mixer and extrusion temperature, for example, cannot call into question the fact that the embodiments of claim 2 do not show the purported improvements/effects (here the specific effects i) to iii) as recited in claim 2).

- 3.6 There are thus serious doubts, substantiated by verifiable facts, as to whether the claimed invention is sufficiently disclosed (see Case Law of the Boards of Appeal, 10th edition, 2022, III.G.5.1.2.c). The non-working examples encompass different titanates and different classes of carbonaceous athermanous compounds.
- 3.7 The burden of demonstrating sufficiency of disclosure has thus shifted to the patent proprietor (see Case Law of the Boards of Appeal, 10th edition, 2022, III.G.5.2.1, first paragraph), which has not discharged this burden.
- 3.8 Consequently, the ground for opposition under Article 100(b) EPC, lack of sufficiency of disclosure, prejudices the maintenance of the patent as granted.

4. *Request for remittal to the department of first instance (Article 11 RPBA and Article 111(1) EPC)*

According to the appellant, the case should be remitted to the department of first instance for further prosecution if the main request is not considered to be allowable.

The board is not convinced.

First, the appellant only filed this request shortly before the oral proceedings before the board.

Second, all grounds for opposition, including inventive step starting from D4 and sufficiency of disclosure, were dealt with in the decision under appeal.

Third, the board is not convinced by the appellant's argument that by not allowing the request for a postponement of the oral proceedings, the opposition division had it made impossible to clarify issues in relation to the experimental details applied in the experiments featured in D22. The appellant could have reacted to D22 on several occasions, in particular when filing its grounds of appeal.

Thus, the board saw no special reasons within the meaning of Article 11 RPBA for remitting the case to the department of first instance/opposition division for further prosecution.

#### **Auxiliary requests**

5. The above conclusion as to the lack of an inventive step of the main request also applies to the subject-

matter of the first, third, and seventh to ninth auxiliary requests for the reasons set out above. The board endorses the corresponding findings in the opposition division's decision. In particular, as stated in point 4 of the decision under appeal, whilst claim 1 of the main request is directed to the use of the mineral  $ABX_3$  having perovskite structure in a vinyl aromatic polymer foam, independent claim 14 of the first auxiliary request, for example, describes the *expandable polymer granulates* from which the foam is prepared. Hence, the corresponding independent claims directed to the expandable polymer granulate in the first, third, and seventh to ninth auxiliary requests also lack an inventive step for the reasons indicated in point 1 *supra*.

6. The claims of the second auxiliary request correspond to claims *excluding* those directed to *granulates*, such as granted claim 15 (cf. claim 14 of the first auxiliary request). Hence, the claim set referred to by the appellant in its grounds of appeal includes the subject-matter encompassed by claim 1 of the first auxiliary request. However, the above reasoning relating to sufficiency of disclosure in relation to claim 2 as granted also applies to claim 1 of the first auxiliary request. The second auxiliary request thus does not meet the requirement of sufficiency of disclosure either (Article 83 EPC).
7. The claims of the fourth auxiliary request correspond to claims 10 to 16 of the third auxiliary request. Thus, the reasons set out above in relation to the lack of inventive step of claim 13 of the third auxiliary request also apply to the corresponding claim 4 of the fourth auxiliary request (cf. points 1 and 5 above).



8. Claim 1 of the sixth auxiliary request is limited to carbon black as the athermanous additive in the expandable polymer granulates. However, as discussed at the oral proceedings before the board, the objections in relation to the lack of inventive step also apply to claim 1 of the sixth auxiliary request.

The appellant argued that carbon black was a further distinguishing feature, that it was only used in Comparative Example 1 of D4 and that it was a less preferred alternative amongst the carbonaceous athermanous additives used.

As correctly observed by the respondent, however, claim 1 of D4 recites carbon black as an alternative to coke and graphite. In the absence of a demonstrated technical effect associated with the selection of carbon black as the carbonaceous athermanous agent in D4, the objective technical problem remains the provision of *alternative* foamable and foamed vinyl aromatic polymer compositions. The solution would have been obvious to the skilled person in view of the teaching of D4 as the closest prior art and D5. The respondent correctly argued that a skilled person wishing to provide alternatives would have considered selecting carbon black and the specified amount of perovskite as the titanate additive under d).

Similar reasons apply to the fifth auxiliary request, which is broader in scope than the sixth auxiliary request.

9. The finding of a lack of sufficiency in relation to claim 2 as granted also applies for essentially the same reasons to claim 1 of the tenth auxiliary request.

10. *Admittance of the eleventh auxiliary request (Claim Set D-X)*

10.1 This request was filed at the oral proceedings before the board. The appellant argued that there were cogent reasons which justified the admittance of Claim Set D-X. The objection under Article 56 EPC in respect of the sixth auxiliary request had not been mentioned in the board's communication under Article 15(1) RPBA and had not been the subject of the appeal proceedings. As to this point, the board takes the view that first, the board had advised the parties that its communication did not necessarily raise all of the issues that may be considered at the oral proceedings. Second, the aforementioned objection was not new; it was based on an existing line of argument that had already been raised in relation to claim 1 of the main request. In this regard, the communication had set out in point 5.2 that in claim 1 of D4 the carbonaceous athermanous material was selected from coke, graphite and/or carbon black. The board concluded that choosing a perovskite material and using it in combination with the carbonaceous athermanous additives specified does not confer an inventive step.

10.2 The appellant also argued that the new request served to overcome the board's objection under Article 56 EPC in relation to the sixth auxiliary request that it had made during the oral proceedings. The request contained a single independent process claim that had already been present in a previous claim set (eighth auxiliary request or Claim Set D). No substantive objections had been raised by the respondent against (the corresponding claim of) Claim Set D as previously presented. Moreover, the single independent claim was not complex to assess.

10.3 The board is not convinced. This request is directed to subject-matter that was not assessed in substance in the opposition division's decision or by any of the parties in the appeal proceedings. On the contrary, by deleting the entire subject-matter that had been assessed by the opposition division in its decision and by the opponent and the board in the appeal proceedings, i.e. the independent claims directed to the use of a mineral having perovskite structure and to an expandable polymer granulate comprising said mineral, the appellant created an entirely *fresh case*.

Moreover, contrary to the argument of the appellant, the opponent had attacked granted claim 14 under inventive step in the opposition proceedings and argued that the objections raised against the granted claims of the main request also applied to auxiliary requests A to E.

10.4 Taking this amendment into account would have resulted in a substantial and unforeseeable change to the subject-matter under discussion at the very end of the appeal proceedings, namely during the oral proceedings before the board.

10.5 Admitting a request involving such a shift of the substantive discussion would also have been detrimental to *procedural economy*.

10.6 For these reasons, the board did not take that request into account (Article 13(2) RPBA).

**Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:



K. Götz-Wein

A. Haderlein

Decision electronically authenticated