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Datasheet for the decision of 13 November 2024

Case Number: T 1977/22 - 3.3.06

Application Number: 14875698.4

Publication Number: 3086872

IPC: B01J23/10, B01J23/63, B01D53/94, B01J35/10

Language of the proceedings: EN

Title of invention:
INORGANIC COMPOSITE OXIDE MATERIAL, PREPARATION AND USE FOR EXHAUST GAS PURIFICATION CATALYSTS

Patent Proprietor:
RHODIA OPERATIONS

Opponent:
Neo Chemicals & Oxides (Europe) Ltd

Headword:
Open-ended ranges/RHODIA

Relevant legal provisions:
EPC Art. 100(b), 83, 100(c), 123(2), 112
RPBA 2020 Art. 11

Keyword:
Grounds for opposition - insufficiency of disclosure (no) - added subject-matter (no)
Sufficiency of disclosure - enabling disclosure (yes)
Remittal - special reasons for remittal (yes)
Referral to the Enlarged Board of Appeal - (no)

Decisions cited:
T 0226/85, T 0292/85, T 0129/88, T 0487/89, T 0409/91, T 0435/91, T 1008/02, T 1018/05, T 0624/08, T 2213/08, T 1697/12, T 2344/12, T 1943/15, T 0113/19, T 0398/19, T 1942/21

Catchword:

Where a claimed invention includes an open-ended range physical parameter that could not be reproduced using common general knowledge, the range may be considered to meet the requirement of reproducibility over the whole scope when it can be (at least implicitly) derived from the teachings in the specification that by operating within the scope of certain essential structural and/or process features, the skilled person would be able to adjust the parameter to achieve different values within the open-ended range without undue effort, and the claimed subject-matter defines these essential features.

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Case Number: T 1977/22 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 13 November 2024

Appellant: (Patent Proprietor)	RHODIA OPERATIONS 9 rue des Cuirassiers Immeuble Silex 2 Solvay 69003 Lyon (FR)
Representative:	Kraus & Lederer PartGmbB Thomas-Wimmer-Ring 15 80539 München (DE)
Respondent: (Opponent)	Neo Chemicals & Oxides (Europe) Ltd. c/o Tmf Group, 8th Floor 20 Farringdon Street London EC4A 4AB (GB)
Representative:	Bird & Bird LLP Maximiliansplatz 22 80333 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 22 June 2022 revoking European patent No. 3086872 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	J.-M. Schwaller
Members:	S. Arrojo
	C. Heath

Summary of Facts and Submissions

I. An appeal was filed by the patent proprietor against the decision of the opposition division to revoke European patent No. 3 086 872 for non-compliance with the requirements of Article 83 EPC and 123(2) EPC.

II. With the statement of grounds of appeal, the appellant contested the arguments of the opposition division and filed several sets of amended claims as auxiliary requests 1 to 14.

III. Claim 1 as granted (main request) reads as follows:

"1. An inorganic composite oxide material, comprising:
(a) from 25 to 90 pbw Al_2O_3;
(b) from 5 to 35 pbw CeO_2;
(c)(i) from 5 to 35 pbw MgO, or
(c)(ii) from 2 to 20 pbw Pr_6O_{11}, or
(c)(iii) from 5 to 35 pbw MgO, and from 2 to 20 pbw Pr_6O_{11}; and
(d) optionally up to 10 pbw of a combined amount of oxides of one or more dopants selected from transition metals, rare earths, and mixtures thereof, and exhibiting a BET specific surface area:
• of greater than 150 m^2/g after calcining at 900°C for 2 hours; or
• of greater than 85 m^2/g after calcining at 1000°C for 4 hours; or
• of greater than 40 m^2/g after calcining at 1100°C for 5 hours."

IV. In its reply, the opponent and respondent requested that the appeal be dismissed.

V. In a submission dated 16 July 2024, the appellant requested that the case be remitted to the opposition division if one of the requests was found to meet the requirements of Articles 83 and 123(2) EPC. Further, it submitted new auxiliary requests 1 to 3, indicating that if these were admitted, auxiliary requests 1 to 14 then on file would be withdrawn.

VI. In a reply dated 29 July 2024, the respondent requested that the newly filed auxiliary requests as well as the arguments brought forward for the first time in the last submission not be admitted into the appeal proceedings pursuant to Article 13(2) RPBA.

VII. In its preliminary opinion, the board expressed its view that the invention according to the claims as granted was sufficiently disclosed.

VIII. In a submission dated 11 October 2024, the respondent disagreed with the board and requested that two questions be referred to the Enlarged Board of Appeal to clarify whether a claimed product including a physical parameter defined by means of an open-ended range satisfied the requirements of Article 83 EPC.

IX. The appellant replied that it had no objection to a referral and proposed four questions, should the board decide so.

X. At the oral proceedings, which took place on 13 November 2024, the parties' final requests were the following:

The appellant requested that the contested decision be set aside and the patent be maintained as granted (main request) or, alternatively, that the case be remitted

to the first instance for further prosecution. As an auxiliary measure, the patent should be maintained in amended form based on one of auxiliary requests 1 to 3 filed with the letter dated 16 July 2024, or of one of auxiliary requests 1 to 14 filed with the grounds of appeal.

The respondent requested that the appeal be dismissed or that the questions proposed in its letter dated 11 October 2024 be referred to the Enlarged Board of Appeal. Alternatively, in the event that any of the requests was found to meet the requirements of Articles 83 and 123(2) EPC, the patentability issues should be dealt with before the present board without remittal.

Reasons for the Decision

1. Open-ended parameter

1.1 The term "open-ended range" refers to a numeric range that explicitly defines one end value, while omitting the other. This type of definition is very common in some technical fields as a way to indicate that a given parameter should be as high or as low as possible.

1.2 While the underlying decision and those cited below concern open-ended ranges, the underlying discussion and conclusions appear to be similarly applicable to ranges with a theoretical upper or lower boundary, provided that achieving values close to such a boundary would be technically challenging; for example, cases where the purity of a substance is defined as greater than X%, thus limited by a theoretical upper boundary of 100%, but including values very close to 100%; or where the concentration of a contaminant is defined as less than Y%, thus limited by a theoretical lower

boundary of zero, but including values very close to zero.

1.3 The requirement of sufficiency of disclosure in cases where a claim defines a *desideratum* (i.e. a result to be achieved, function, or technical effect) using an open-ended range has been the subject of extensive discussion in the case law. There is thus a need to clarify how the open-ended definition affects the reproducibility of the invention over the whole scope of the claim, and in particular to determine the standards to be applied to decide whether the skilled person would be enabled to achieve parametric values over the whole scope of the open side of the range.

1.4 To address this question, the board will first examine the general criteria for assessing the requirement of reproducibility of an invention over the whole claimed scope, as derived from the landmark decisions which developed the relevant case law in this respect. The board will then review the case law dealing with open-ended ranges and sufficiency of disclosure, and the discussion will continue with the key question of how to apply the requirement of reproducibility over the whole scope to inventions defined in terms of an open-ended range (*desideratum*). Finally, the proposed criteria will be applied to address the question of sufficiency of disclosure in the underlying case.

2. Reproducibility over the whole scope of the claim

2.1 When an invention is defined in terms of a *desideratum*, sufficiency of disclosure is generally assessed on the basis of the principle of reproducibility over the whole scope, which was proposed and developed in a number of early landmark decisions (see in particular

T 435/91, **T 292/85**, **T 226/85**, **T 409/91**, and **G 1/03**).

2.2 In **T 435/91**, an additive was defined by its function without any reference to its nature or structure. Since the patent proposed only a few specific additives providing this function, the attempt to generalise such a narrow teaching to cover all possible working additives (i.e. those achieving the defined function/ *desideratum*) was not considered to be commensurate with the technical contribution of the patent (Reasons 2.2.1). In other words, since the teaching in the patent was limited to a few specific examples achieving the defined *desideratum*, there was no support for an invention covering all possible additives providing this function. The board therefore concluded that the invention was insufficiently disclosed, as it was not reproducible over the whole scope of the claim.

2.3 In **T 292/85**, the claim also defined some components in terms of their function. However, in this case the board concluded (Reasons 3.1) that the invention was sufficiently disclosed, because the information at hand was considered to enable the skilled person to identify multiple alternatives achieving the required function. Even though it was acknowledged (Reasons 3.1.2 and 3.2.1) that the broadly defined claim covered "an unlimited number of possibilities" including non-working embodiments (yet-to-be-discovered or non-reproducible variants), the provision of sufficiency of disclosure did not require (see Reasons 3.1.5 and 3.2.1-3.2.2) that all non-working embodiments be excluded from the scope of protection, or that all working variants could be identified, but simply that the skilled person be enabled to identify and reproduce multiple variants over the scope of the claims. These conclusions were subsequently confirmed in **G 1/03**,

which indicated (Reasons 2.5.2, 2nd sentence) that where the claim covered "a large number of conceivable alternatives" and encompassed non-working embodiments, the invention could still be sufficiently disclosed if "the specification contains sufficient information on the relevant criteria for finding appropriate alternatives over the claimed range with reasonable effort".

2.4 It follows from the above decisions that where the information at hand provides support for reproducing the *desideratum* defined in the claim over a broad scope, the invention can be correspondingly generalised by omitting some of its structural aspects, as these are deemed to be "fit for generalisation" (**T 435/91**, Reasons 2.2.1 and Headnote). However, any feature considered to be essential for achieving the *desideratum* must also be defined in the claim (see **T 226/85**, Reasons 4), as otherwise the scope of the invention would extend beyond the actual technical contribution of the patent.

2.5 In this context, some of the cited decisions, namely **T 226/85** (Reasons 4 and 5) and **T 409/91** (Reasons 3.3–3.4) explain that the requirement to include all features deemed essential to achieving this *desideratum* highlights an overlap between the issues of essential features or support by the description under Article 84 EPC and sufficiency of disclosure under Article 83 EPC, as both are considered to stem from the same legal principle that the patent monopoly must be justified by the technical contribution to the art.

2.6 In summary, the main idea behind the principle of reproducibility over the whole scope is that where an invention is defined as a combination of process and/or

structural features (A+B) to achieve a certain result or *desideratum* (X), the skilled person should be enabled to achieve the result (X) over the whole scope of the claim, which is intended to ensure that the breadth of the claimed invention is commensurate with the teachings of the patent, i.e. that the scope of protection is restricted to the actual technical contribution of the patent. This assessment should be based on balanced criteria, avoiding unrealistic requirements, such as excluding all non-working embodiments or providing instructions to identify every possible working embodiment, while still ensuring that the claim includes all features essential to achieving the defined *desideratum* and that the breadth covered by the functional definition is commensurate with the teachings of the patent.

3. Open-ended range *desideratum* and sufficiency of disclosure

3.1 According to **T 487/89** (Reasons 3.5), where the claim defined the tenacity and the toughness of a fibre using an open-ended range, the question of whether defining an "inherently desirable characteristic" (i.e. a result to be achieved or *desideratum*) in terms of an open-ended range is objectionable under sufficiency of disclosure depends on the surrounding circumstances. In particular, where a claim seeks to embrace values as high as can be achieved with a particular combination of features (i.e. "given the other parameters in the claim"), the open-ended range should in principle be considered to be unobjectionable under sufficiency of disclosure.

3.2 In **T 129/88** (see Reasons 2.1.4), where the claim defined four properties of a fibre using an open-ended

range, the board followed the reasoning in **T 487/89** but indicated that under certain circumstances, the definition of *desiderata* in terms of an open-ended range could lead to a "speculative claim" (i.e. a claim covering yet-to-be-discovered inventions) and thus be objectionable under sufficiency of disclosure, pointing out that this problem could be avoided by defining other interrelated parameters which, in practice, would implicitly impose an upper boundary on the open-ended range.

3.3 In **T 1008/02**, the board built on the idea of speculative claims introduced in **T 129/88** and concluded (Reasons 3.5) that the invention defined in terms of an open-ended liquid absorbing capacity of a fibrous material could not be reproduced over its whole scope. In particular, since the patent did not provide information on how to reproduce different variants with parametric values falling within the open-ended range, the reference to two isolated products having parametric values slightly above the lower end-value of the range was considered to provide insufficient support for defining the invention using an open-ended range.

3.4 In **T 624/08** (Reasons 3.2.2) and **T 2213/08** (Reasons 6.2-6.3), the boards argued that the invention was sufficiently disclosed, because the liquid-absorbing compositions defined in terms of an open-ended fluid absorbing capacity was also restricted by the process steps required to obtain it, which implied that the parametric values of the open-ended range were, in practice, limited to those values obtainable with such process.

3.5 In **T 1697/12** (Reasons 5.5.1-5.5.5), **T 2344/12** (Reasons 1.1.2), **T 113/19** (Reasons 2.1) and **T 1942/21** (Reasons 1), the boards argued that the definition of an open-ended range in the claims (the water absorbancy of a composition in **T 1697/12**, the CO adsorption amount of a catalyst in **T 2344/12**, the specific surface area of a solid composition described as a "*desideratum*" in **T 113/19**, or the amount of methane in a synthesis gas in **T 1942/21**) led to a problem of sufficiency of disclosure where it was clear that the invention intended to protect embodiments going beyond the technical contribution of the patent as a whole, i.e. inventions which were technically reasonable but not achievable with the information at hand. In such cases, the objection could be overcome by closing the range (see **T 2344/12**), by defining an interrelated parameter indirectly imposing an upper boundary on the open-ended range (see **T 113/19**) or by restricting the invention to products obtainable with a specific process (see **T 1697/12**). In **T 1942/21**, the board also noted that, in other cases, the use of open-ended physical parameters had been considered allowable.

3.6 The board in **T 398/19** (reasons 1.5.1-1.5.4) concluded that the omission of the upper limit of the range for the specific surface area of a solid composition did not constitute an attempt to extend the scope of protection to embodiments which could not be achieved with the information at hand, because the specification provided detailed information and examples on how to reproduce variants with parametric values falling within the open-ended range, and the claimed product was not only defined in terms of the open-ended range physical parameter, but was also limited by the structural features required to achieve values within that range.

4. Reproducibility over the whole scope of open-ended ranges

4.1 As explained in the discussion of the landmark decisions, where an invention is defined in terms of a *desideratum* or result to be achieved, the problem of reproducibility over the whole scope generally arises in situations where the invention covers a wide range of alternatives for achieving the defined result, particularly where the scope covered by the claim is broader than justified by the teaching of the patent.

4.2 Where the *desideratum* is, as in the present case, defined in terms of an open-ended range for a physical parameter of a product, the problem of reproducibility over the whole scope is analogous to that addressed in the landmark decisions, with the key distinction being that the inclusion of non-working embodiments may also stem from the *desideratum* itself, as the open definition broadens the claimed scope in such a way as to implicitly encompass non-working embodiments, i.e. irreproducible parametric values (i.e. unrealistically high) and/or yet-to-be-discovered alternatives (i.e. values that would only be achieved with inventive skill).

4.3 Although it is apparent that the inclusion of non-working embodiments is at the root of the problem of sufficiency of disclosure, the argument that the claim covers non-working embodiments is not in itself sufficient to conclude that the invention would not be reproducible over the whole scope. Rather, the key criterion is whether the teachings in the specification and/or from common knowledge would enable the skilled person to identify multiple working variants over the scope of the claim with reasonable effort, or from a

different perspective, whether the information at hand is commensurate with or justifies the breadth of the claim.

4.4 The assessment of reproducibility over the whole scope thus requires a substantive analysis of the teachings in the patent and, where applicable, in light of common knowledge, particularly those aspects deemed relevant for reproducing the *desideratum*, i.e. for achieving parametric values falling within the open ended range. Only once this analysis has been carried out can the fundamental question be answered as to whether such teachings would overcome the burden of enabling the skilled person to reproduce the invention over the whole scope of the claim.

4.5 The relevant teachings in the patent may take the form of instructions, technical explanations, examples and/or any other type of evidence. Moreover, where the achievement of the *desideratum* is technically challenging and cannot be solved with common knowledge, the teachings should include direct or indirect pointers to the structural and/or process features required to achieve parametric values falling within the open-ended range. In other words, the teachings should not only demonstrate that the *desideratum* can be achieved (e.g. referring to isolated known products with values falling within the claimed range), but should also enable the skilled person to identify the technical features required to adjust the parametric values to achieve the required results. These features constitute the (alleged) technical contribution of the invention, or in other words, they are the essential features proposed for overcoming the burden of reproducing the technically challenging open-ended *desideratum*. Therefore, as explained above, these

essential features should also be defined in the claim to ensure the invention is reproducible over the whole scope.

4.6 The most controversial aspect in the underlying discussion is the burden to be applied for determining whether the information at hand would enable the skilled person to reproduce the open-ended range over the whole scope of the claim, in particular because the interpretation of the concept "over the whole scope" is not straightforward when applied to a range with no specific upper limit. While the board's preliminary opinion favoured a relatively low burden in this matter, extensive discussions have led to some reassessment and qualification of that initial stance:

4.6.1 On the one hand, the board maintains its preliminary opinion that reproducing the open-ended range over the whole scope should not be interpreted literally as requiring teachings enabling the skilled person to achieve any parametric value in the upward direction. Interpreting the concept of "over the whole scope" literally would impose a technically unsurmountable burden, as no amount of teachings would ever be sufficient to identify all possible working embodiments in the upward direction of the range. As indicated in the preliminary opinion, imposing such a requirement would be contrary to the conclusions in the landmark decisions and the standard practice of the Boards when interpreting broad features.

4.6.2 In particular, the landmark decisions warn against such excessively formalistic/literal approaches and conclude that the provision of sufficiency does not require that all non-working embodiments be excluded or that every working embodiment within the scope of the claim be

enabled. Indeed, the primary argument in these decisions is based on the recognition that claims defining a *desideratum* often encompass "an unlimited number of possibilities" (see **T 292/85**, Reasons 3.1.2) or at least "a large number of conceivable alternatives" (see **G 1/03**, Reasons 2.5.2), so that under a literal interpretation, the requirement of reproducibility over the entire scope would almost invariably be impossible to satisfy. The criteria proposed in the landmark decisions are thus based on a more balanced interpretation of the requirement to reproduce the invention over the whole scope.

4.6.3 Furthermore, if such a high burden were to be applied on the ground that the open-ended range does not specify the upper limit, then for reasons of consistency, the same strict standard and literal interpretation should be applied to any claim defining a technical purpose, function or *desideratum* in broad or vague terms. If this were the case, any broad directional reference in a claim to an improvement, optimisation, increase, decrease, maximisation, minimisation, etc., of certain factors or properties would automatically impose the virtually insurmountable burden of enabling an invention capable of achieving all possible results in the upward/downward direction (as long as they are not technically absurd), which clearly contradicts the standard practices of the Boards in this respect.

4.6.4 On the other hand, the board has qualified its preliminary opinion in this question and does no longer believe that the burden to reproduce the open-ended range over the whole scope would be overcome by the disclosure of (isolated) embodiment/s or product/s with parametric values falling within the open-ended range.

If such a standard were to be adopted, the burden of reproducing an open-ended range would be similar to, or even lower than, if it had been defined as a closed range, which would be inequitable, as an open-ended definition clearly covers a wider range of embodiments. This is also in line with the position in the landmark decision **T 435/91** (see Headnote and Reasons 2.2.1), which concluded that to enable a *desideratum* over the whole scope it is not enough to disclose isolated examples (i.e. specific products achieving the defined *desideratum,* without any teachings on how other variants could be reproduced). Instead, the technical concept proposed to achieve the *desideratum* should be "fit for generalisation", that is it should be applicable to achieve different working embodiments over a range commensurate with the breadth covered by the claim.

4.6.5 The board has concluded that, based on the discussion in the landmark decisions and the relevant case law, open-ended ranges should be interpreted as equivalent to a directional requirement to adjust and increase the parameter to obtain values as high as achievable (beyond the lower end value) with the structural and/or process features defined in the claim.

4.6.6 This interpretation takes into account the overall subject-matter of the invention, rather than interpreting the open range in isolation from the structural and/or process features proposed to achieve it, which realistically reflects the legitimate idea behind this type of definition, namely to protect inventions based on the combination of specific structural and/or process features for the purpose of maximising certain parametric values.

4.6.7 From this perspective, the burden to enable the open-ended range primarily depends on how the invention is defined in the claim. In particular, two distinct situations can be identified based on whether the element at issue is defined solely by the open-ended range *desideratum*, or (also) by a specific combination of structural and/or process features designed to achieve that *desideratum*:

(a) where the element defined in terms of an open-ended range *desideratum* is not restricted by any structural and/or process features, the situation will be analogous to that found in the landmark decisions, since such subject-matter represents an attempt to protect any solution for maximising the parameter. This definition not only encompasses all possible alternatives for achieving the *desideratum* but also covers a broad range of parametric values, as the open range is not limited to the values achievable with a specific combination of features. Inventions defined in this way can generally not be enabled unless the range is directly or indirectly limited by closing the range or by defining other interrelated parameters imposing an upper boundary (unless it is demonstrated that the parameter can be easily adjusted and increased using common knowledge, e.g. temperature > 200°C).

(b) Where the claim or the element defined in terms of an open-ended range *desideratum* is further restricted by structural and/or process features, the burden to enable it would involve identifying teachings (in the specification and/or from common knowledge) that, at least implicitly, indicate that the skilled person would be in a position to achieve different parametric values within the

claimed range by making trivial adjustments within the scope of these features (i.e. without undue effort). Where this requirement is met, the claim will be limited to a specific technical solution demonstrated to achieve values within the open-ended range, ensuring that the scope of protection is commensurate with the teachings of the specification, or from a different perspective, the breadth of the open-ended range will be effectively restricted to the values achievable by applying the teachings of the patent and/or the information at hand.

4.7 While this approach avoids setting unrealistic goals, the applied standards align with those proposed in the landmark decisions, and the burden is higher than would be the case if the *desideratum* had been defined with a closed range. In particular, the burden would not be overcome by the disclosure of isolated embodiments falling within the claimed range - i.e. known (e.g. commercially available) products with parameter values falling within the claimed range without any indication of how the parameter is achieved - as such teachings would not enable the skilled person to actually adjust or increase the parametric values. However, such a disclosure may be considered sufficient to enable an invention defined in terms of a closed range (provided that the values of the known products extend over the defined range), since in such a case the teachings in the patent (i.e. the availability of products with certain parametric values) would be commensurate with the breadth of the claim (i.e. covering the use of products with parametric values within a specific range).

4.8 The proposed approach also explains or at least is consistent with the different outcomes in the above cited case law decisions concerning open-ended ranges and sufficiency of disclosure:

4.8.1 Firstly, the decisions concluding that the open-ended range *desideratum* is reproducible over the whole scope relate to products defined not only by open-ended ranges but also by the structural and/or process features which, according to the specification, enable the skilled person to adjust and increase the parameter to achieve values within the claimed open range.

4.8.2 In particular in the early case **T 487/89**, the product in question is limited by a process that, according to the specification, enables the skilled person to achieve high parametric values. The board thus concluded (Reasons 3.5) that the open-ended range was reproducible over the whole scope, as it merely seeks to embrace values as high as achievable with these process features. Analogous conclusions and arguments were made in **T 624/08** and **T 2213/08**, both of which relate to products defined in terms of a process shown to enable the skilled person to achieve parametric values within the claimed range. Finally, in **T 398/19**, the board explicitly argued (Reasons 1.5.3) that the claimed invention was not only restricted in terms of the open-ended range but also defines the structural features required for maximising the parametric values.

4.8.3 By contrast, in those decisions concluding that the open-ended range *desideratum* is not reproducible over the whole scope, the products in question were not restricted by any structural and/or process features, or at least not by features shown to enable the skilled person to achieve high parametric values.

4.8.4 In particular, in **T 1008/02**, the claim defined a product (i.e. a superabsorbent material) in terms of an open-ended range *desideratum* without specifying any of its structural and/or process features. The board thus concluded (Reasons 3.5) that the reference to isolated products with values falling within the claimed range (with no teachings as to how such values can be reproduced or modified) was insufficient to enable the reproduction of the open-ended range. In **T 1942/21**, the claim did not define any structural or process feature intended to achieve high parametric values (i.e. high proportions of methane), and the board concluded (see Reasons 1) that the methods known in the art would only enable the skilled person to reproduce specific values within the open range. In **T 2344/12**, the claim defined some structural aspects (i.e. the maximum concentration of Pt), but the board held (Reasons 1.1.2) that the evidence on file did not clearly suggest that this feature would enable the skilled person to adjust and increase the parametric values beyond those achieved in the examples.

4.8.5 In decision **T 1697/12**, the board held (Reasons 5.4.1) that the patent taught how the skilled person would have been able, by making trivial adjustments to the (essential) process described therein, to adjust or increase the parameter in question and obtain embodiments with different values within the claimed range. Since the higher-ranking requests did not define these essential process features, the board concluded that the invention according to those requests was not reproducible over the whole claimed scope. However, the outcome was different for auxiliary request 11 (see Reasons 10.1), which was considered reproducible over the whole scope because the claim was restricted by the essential process features.

4.9 In light of the above discussion, it becomes clear that, once the specific circumstances of each case (i.e. how the invention is defined and described) are considered, the principles and criteria applied by the different boards are largely consistent and align with the approach proposed by the present board, at least in terms of the final outcome. In other words, the differing outcomes in the cited case law decisions are primarily attributable to case-specific factors, rather than to any fundamental divergence in the general criteria applied by the boards.

4.10 This is not to suggest that all boards apply identical standards. In some instances, the burden required to enable the open-ended range was higher than in others, e.g. some boards deemed it sufficient to provide teachings for achieving different values above the lower end value, while others considered that the skilled person should be enabled to achieve values higher than those in the examples. However, these differences do not arise from fundamental disagreements over principles or criteria but can instead be attributed to the inherent and unavoidable variations between different boards and across individual cases in the assessment of compliance with the sufficiency of disclosure provision (or, indeed, any other provision).

4.11 There are also minor differences in how each board explains the enablement of open-ended ranges. In particular, in most of the cited case law decisions it is suggested that for an open-ended range to be enabled, the open side of the range should be directly or indirectly limited by other features in the claim. While this view is consistent with the approach proposed by the present board, there are some aspects which need to be clarified to avoid misunderstandings.

In particular, it should be noted that there are qualitative differences between (i) inventions requiring a more or less specific limitation of the numerical values of the range so as to make it equivalent to a closed range, and (ii) inventions requiring a conceptual limitation of the open-ended range to the values achievable with the proposed technical contribution, i.e. a limitation in terms of the structural and/or process features proposed to reproduce the open-ended range.

4.11.1 Case (i) corresponds to those patents whose only relevant teaching, if any, is the disclosure of isolated embodiments having parametric values falling within the claimed range (e.g. commercially available products). As indicated above, under such circumstances the information at hand may only support the definition of an invention in terms of a closed range, so the only solution to make the invention reproducible over the whole scope may in fact to directly or indirectly limit the numerical values of the open-ended range by closing it or by defining other interrelated parameters imposing an upper boundary. This solution is consistent with the approach proposed here, as it essentially involves narrowing the breadth of the claim to make it commensurate with the technical teachings of the patent. Case **T 1008/02**, discussed above, provides a good example of this situation.

4.11.2 The situation in case (ii) relates to patents including enabling teachings for reproducing the open-ended range. While the requirement to define additional structural and/or process features may be explained (as in **T 1697/12**, Reasons 10.1, or **T 398/19**, Reasons 1.5.2) as a way of indirectly restricting the open side of the range to values achievable with those features, this

scenario differs from the limitations of the range in case (i) in that the restriction is not meant to impose a more or less specific numerical boundary on the open end (i.e. to close the range) but rather to confine the claim to the actual technical contribution of the patent (i.e. the specific structural and/or process features proposed to achieve parametric values extending over the open-ended range).

4.11.3 The differences in the explanations found in the case law decisions are therefore not substantive or resulting from any fundamental divergence but rather stem from addressing the issue from a different perspective.

4.12 As a final remark, the board observes that the present approach also resolves the alleged issue of open-ended ranges unfairly hindering other parties from protecting future inventions aimed at further increasing the parameters in question:

4.12.1 Under the proposed approach, inventions defining a technically challenging open-ended range *desideratum* would in principle be considered to be enabled only when the claim defines the structural and/or process features deemed essential for achieving the required high parametric values. Furthermore, the invention would not be allowed (under sufficiency of disclosure and inventive step) unless the achievement of high parametric values with the proposed structural and/or process features is both credible and represents a non-obvious contribution over the prior art. There is thus no viable path for protecting inventions achieving indefinitely high parametric values with undetermined, trivial or known technical solutions.

4.12.2 Consequently, an inventor subsequently finding an alternative solution for achieving high parametric values would not be affected by the earlier patent as long as the proposed technical solution (i.e. the structural and/or process features) is different, irrespective of the actual parametric values achieved with one invention or the other.

4.12.3 Where the new invention represents a further development falling within the broader scope of the earlier patent, but achieving even higher parametric values, it may be considered as a dependent invention. This outcome is however equitable, as the new invention would arguably be built on the original, non-obvious technical contribution of the earlier patent.

4.12.4 Thus, as long as the open-ended range *desideratum* is defined in combination with the structural and/or process features essential for reproducing different embodiments across the range, the open-ended definition serves to ensure fair compensation for future inventions that are built upon the non-obvious technical contribution of the earlier patent, which exemplifies the very essence of selection inventions and highlights (again) the legitimate purpose behind the definition of inventions in terms of an open-ended range *desideratum.*

4.12.5 It also follows from the above discussion that once it is demonstrated that the skilled person, by operating within the essential structural and/or process features, would be able to adjust the parameter to achieve different values within the open range without undue effort, the further question of how far the actual numerical values extend beyond the lower end-value is to a large extent irrelevant for the

enablement of the open-ended range. More specifically, as explained in the previous paragraphs, once the invention is defined by a combination of structural and/or process features that provide a non-obvious and enabling solution for achieving values beyond the lower limit of the range, an open-ended definition does not grant the patent proprietor an unfair advantage, regardless of whether the invention surpasses this numerical limit by a large or small extent.

4.13 In summary, the board considers that the key criterion for enabling a technically challenging open-ended range *desideratum* over the whole scope of the claim is the provision of teachings demonstrating that, by operating within the scope of specific (essential) structural and/or process features, the skilled person would be in a position to achieve multiple variants of the invention without undue effort i.e. embodiments with different parametric values falling within the open-ended range. If this condition is met, an invention that defines both the open-ended range *desideratum* and the essential structural and/or process features required to achieve it may, in principle, be considered reproducible over the whole scope (at least with regard to the reproducibility of the open-ended range itself), irrespective of how far the numerical values can be extended beyond the lower end of the open-ended range.

5. No reason to refer questions to the EBoA

5.1 Both parties observed that there appeared to be two divergent lines of reasoning in the case law: a first one regarding the definition of open range *desiderata* as unobjectionable under sufficiency of disclosure, and a second one which held that open-ended ranges were inherently irreproducible over the whole scope and

should therefore be directly or indirectly limited. The parties thus proposed to refer certain questions to the Enlarged Board of Appeal to clarify whether inventions defined in terms of open-ended ranges would be objectionable under sufficiency of disclosure.

5.2 The present board was initially inclined to agree that there were some divergences in the cited case law. However, as explained above, after a more detailed analysis of the cited decisions, the board has concluded that the varying outcomes are primarily due to differences in how the inventions are defined and described in each case, and/or to secondary differences in the burden applied by different boards, rather than to any fundamental divergence in the applied criteria or legal principles.

5.3 In any case, there would be no justification for referring a question to clarify whether open-ended ranges are objectionable under sufficiency of disclosure, as this does not seem to be a point of controversy among the boards. More specifically, none of the case law decisions conclusively state that open-ended ranges are either invariably unobjectionable or objectionable under sufficiency of disclosure.

5.3.1 **T 487/89** is often cited as the primary reference for concluding that open-ended ranges are generally allowable under sufficiency of disclosure, likely due to the use of the term "unobjectionable". However, the actual reasoning in this decision (see Reasons 3.5) does not state that open-ended definitions are invariably unobjectionable. Instead, this decision asserts that, under certain circumstances aligned with the approach outlined in the present decision, the open-ended range would be limited to values achievable

with the features defined in the claim. This approach does not contradict the idea that open-ended ranges may be objectionable when the invention is defined or described differently. In fact, two members of the case board in **T 487/89** also participated in **T 129/88**, which introduced shortly thereafter the notion that open-ended ranges could lead to speculative claims and be objectionable under sufficiency of disclosure.

5.3.2 Moreover, although several decisions emphasise the need to directly or indirectly limit the open-ended range, which could convey the idea that the open definition is invariably objectionable under sufficiency of disclosure, as explained above, this is merely another way of articulating the general principle that the claim must be restricted so that its breadth corresponds to the teachings or technical contribution of the patent. There is nonetheless a fundamental difference between cases that require a numerical restriction to close the range and those that only require a conceptual limitation based on the technical solution proposed to achieve high parametric values.

5.4 The only matter that may warrant discussion or clarification concerns the specific conditions under which the open-ended range is enabled over its entire scope. However, the minor differences identified in this regard are not deemed to impact the "uniform application of the law" or constitute "a point of law of fundamental importance" as required under Article 112(1) EPC. The board therefore concluded that these issues are more appropriately addressed in the present decision.

5.5 In view of the above considerations, there is no reason to refer a question to the Enlarged Board of Appeal.

6. Main request - Article 100(b)/83 EPC

6.1 The board notes that under Article 83 EPC the claimed invention must be disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art and under Rule 42(e) EPC, the description shall describe "*in detail at least one way of carrying out the invention claimed, using examples where appropriate ...* ". Since a granted patent is in principle presumed to be valid, it is the opponent who should demonstrate that the granted claims do not meet the requirements of the EPC, i.e. it is the opponent who carries the burden of proof to demonstrate that a person skilled in the art would be unable to carry out the invention at the time of filing, or in this case that there are embodiments within the scope of the claim which could not be carried out. To discharge its burden, the opponent should normally substantiate the insufficiency objections by identifying non-working embodiments which i) are covered by the claimed invention and ii) cannot be reproduced on the basis of scientific principles (e.g. *perpetuum* mobile), experimental evidence, logical inconsistencies (e.g. clear contradictions) and/or gaps of information which can only be filled with undue burden or inventive skills.

6.1.1 The board first notes that in the case at issue, paragraphs [0050] to [0065] and the two examples of the patent provide a detailed disclosure of how the claimed material can be manufactured.

6.1.2 The opponent has not attempted to rework the examples or any material falling within the scope of the claims using this detailed description, nor has he identified any specific omission of information that would prevent

the skilled person from reproducing the invention. Instead, the opponent has merely alleged, without providing any evidence, that certain unspecified embodiments could not be reproduced.

6.1.3 Since the opponent has not discharged his burden of proof in this respect, the board sees no reason to diverge from its preliminary view that the information in the contested patent would lead to the claimed product through routine trial and error experimentation and that, consequently, the teachings in the patent suffice to meet the requirement of sufficiency of disclosure. Already for these reasons, the requirements of Article 83 EPC are considered to be met.

6.2 Notwithstanding the foregoing observations, the board acknowledges that the present case requires further analysis, as the arguments put forward by the opponent and the opposition division are not based on any alleged difficulty in reproducing specific embodiments within the scope of the invention. Rather, their position is that open-ended ranges inherently encompass non-working embodiments and as such, cannot be enabled over their whole scope, irrespective of the teachings provided in the patent.

6.3 In particular, the opponent argued that the patent lacked sufficient information on how to achieve certain parametric values encompassed by the open-ended ranges defining the specific surface area of the composite material after the various calcination tests defined in claim 1 at issue. Since the open-ended ranges extended to any possible value in the upward direction and were not indirectly limited by other features of the claim, they covered embodiments that were irreproducible or represented inventions yet to be discovered, and so

the requirement of sufficiency of disclosure of the invention was not satisfied.

6.4 At the oral proceedings, the board asked the opponent whether his argumentation relied (at least partially) on the idea that the subject-matter of claim 1 at issue omitted some features deemed to be essential for achieving the parametric values falling within the claimed range, such as the process to produce the inorganic composite oxide.

6.5 The opponent replied that his objections were not based on the argument that the process in particular or any other essential feature in general had been omitted in the subject-matter of claim 1, but rather on the idea that the skilled person would not be enabled to achieve all the embodiments covered by the scope of the open-ended ranges.

6.6 The board disagrees for the following reasons:

6.6.1 The point of contention lies in the criteria used to determine the burden required to enable the reproduction of the open-ended range *desideratum* over the whole scope of the claim.

6.6.2 As indicated above and in the preliminary opinion, the opposed patent (see pars. [0050] to [0065] and [0074] to [0079]) provides both general teachings and specific examples on how to reproduce composite oxides according to the invention.

6.6.3 Although the opponent made broad references in its arguments to the teachings of the patent, in particular stating that they would not enable the skilled person to reproduce the open-ended range over the whole scope

of the claim, no clear reference was made to any specific shortcomings in the actual content of the specification. The main point was instead that since the open ended ranges covered all possible values in the upward direction, they could not possibly be enabled (regardless of the teachings) and should therefore be directly or indirectly limited.

6.6.4 The argument of the opponent is thus clearly predicated on a literal interpretation of the open-ended range, whereby the open side is construed as requiring the reproduction of every conceivable value in the upward direction. As discussed above, the board considers that such a literal or formalistic interpretation of the requirement of reproducibility over the whole scope would be inconsistent with the cited landmark decisions and contrary to the standard practices of the Boards in the interpretation of broad features.

6.6.5 As further extensively discussed in previous paragraphs, the board has concluded that the key criterion for determining whether the open-ended range is enabled over the whole scope of the claim is the availability of teachings showing that, by operating within the scope of certain (essential) structural and/or process features, the skilled person would be able to achieve different variants of the invention over the scope of the claim (i.e. different parametric values within the open-ended range) without undue effort. If that is the case and the claim defines these essential structural and/or process features, the open-ended range *desideratum* may in principle be considered to be reproducible over the whole scope of the claim.

6.6.6 The question to be addressed at this point is whether the teachings provided in the patent specification

satisfy the aforementioned criteria. In this regard, the examples in the patent pertain to two distinct composite oxides, with components and concentrations falling within the scope of claim 1. According to Table I (page 11 of the patent), the specific surface area of the composite oxide in Example 2, after calcination under the conditions defined in claim 1 significantly exceeds the lower boundary of the corresponding open-ended ranges in the claim. Furthermore, when the components and their amounts are adjusted as specified in Example 1, the composite oxide achieves specific surface areas notably higher than those obtained in Example 2.

6.6.7 The evidence in the patent thus indicates that the components and concentrations of the metal oxides forming the composite oxide constitute the essential parameters for adjusting and enhancing the specific surface area after calcination to achieve values within the defined range. Moreover, in view of the results in the two examples, the board is convinced that by making (trivial) adjustments to the components and their concentrations, the skilled person would be able to achieve different parametric values over the open-ended range.

6.6.8 While it might have been open to discussion whether the process proposed for producing the composite oxide (or at least certain steps thereof) should also be considered an essential aspect of the invention (i.e. necessary to achieve parametric values within the open-ended range) and thus defined in the claim, the opponent explicitly stated that its argumentation did not rely on this point. The board also found no justification for introducing this argument *ex officio*.

6.6.9 Since the composite oxide in claim 1 at issue does not only define the open-ended range *desiderata* but also the above mentioned structural features (i.e. the metal oxide components and their amounts) considered to be essential for achieving parametric values within the claimed range, the board concludes that the open-ended ranges *desiderata* defined in claim 1 at issue are enabled by the teachings in the patent and that the invention is reproducible over the whole scope of the claim.

6.7 The invention according to the main request is thus considered to be reproducible over the whole scope of the claims, so the requirement of sufficiency of disclosure under Article 83 EPC is met.

7. Main request - Article 100(c)/123(2) EPC

The opposition ground under Article 100(c) EPC does not prejudice the maintenance of the patent as granted for the following reasons:

7.1 The opponent argued that the subject-matter of claim 13 as granted extended beyond the content of the application as filed, because there was no basis for the back reference to claims 1-9, i.e. *"method for making a porous inorganic composite oxide according to claims 1-9"*. In particular, the subject-matter of method claim 13 at issue was based on claim 24 as filed, which did not refer back to the product claims. Moreover, two different products were originally defined in claims 1 and 10 as filed, so even under the assumption that the method was implicitly intended to make the products according to the patent, there was no way to determine which one of the originally defined materials was intended to be produced with the method

at issue. The only hint in this respect was that the product obtained with original method claim 24 was a "porous inorganic composite oxide", which appeared to indicate that the method was conceived for obtaining the product in claim 10 as filed (also defined as porous and no longer pursued in the claims at issue) and not that in claim 1 as filed (not defined as porous and corresponding to the product in claims 1-9 at issue). The opponent also argued that there was no indication that the broad method defined in claim 24 as filed would necessarily lead to the product in claim 1 as filed.

7.2 The board disagrees therewith, because as stated at the oral proceedings, it is clear from the patent that the claimed composite oxides are manifestly intended to be porous. This is expressly stated in the summary of the invention in par. [0004] of the application, which indicates that it is desirable to form "a porous inorganic oxide...". The idea that the inorganic oxide defined in claim 1 as originally filed and in claim 1 at issue could be a non-porous material would also be inconsistent with the definition in the claims of a high specific surface area after calcination, since it is well known that a high specific surface area is directly related to the porosity. It is also not clear to the board why the sole method described in the application should be considered to aim at obtaining only one of the embodiments described in claims 1 or 10 as filed. The fact that these claims are independent does not necessarily imply that they define different materials, but rather that each focuses on distinct aspects of the inorganic oxide material according to the invention (claim 1 defining the amounts of each component, and claim 10 specifying the crystallite size after calcination of the components). In fact, since

these claims are not mutually exclusive and describe an inorganic oxide material with the same components, the most straightforward interpretation is that, as explicitly stated in pars. [0005] and [0007], they simply intend to define different aspects (i.e. embodiments) of the (same) inorganic oxide material.

7.2.1 The board also notes that there is no need to prove that every conceivable method falling within claim 24 as filed would lead to the product of claim 1 as filed. Instead, all that is required to conclude that the original method was conceived to obtain the material in claims 1 to 9 at issue is that the application as filed directly and unambiguously indicates (at least implicitly) that methods falling within the scope of claim 24 as filed are intended to produce the product in claim 1 as filed. This condition is clearly met, as it is undisputed that the method in claim 24 as filed is defined in broad terms and encompasses the specific methods proposed in the examples leading to the exemplary products falling within the scope of claim 1 at issue. In other words, once established that the specific methods proposed to achieve the exemplary embodiments of the materials of claim 1 to 9 at issue fall within the scope of claim 24 as filed, there is no basis to conclude that defining such method as a way to achieve the material in claims 1 to 9 at issue would confront the skilled reader to new information.

7.2.2 The board therefore concludes that it is directly and unambiguously derivable from the original application that the broad method defined in claim 24 as filed was intended to obtain the different embodiments of inorganic oxide materials according to the invention. Consequently, the back reference in the method claim 13 at issue to the product claims 1 to 9 does not add new

information, so the subject-matter of this claim does not extend beyond the content of the application as filed and so meets the requirements of Article 123(2) EPC.

8. Remittal of the case

8.1 The opponent argued that it would be appropriate to address the question of patentability without remitting the case to the first instance, since a remittal would be detrimental to procedural economy, potentially leading to additional amendments and further delays which would create legal uncertainty.

8.2 Even though it is apparent that bringing the case to a final decision before the board would be desirable for the sake of procedural economy, the board has concluded that there are other factors which justify remitting the case:

8.2.1 The main focus of the opposition proceedings and the written proceedings before the board has been the question of sufficiency of disclosure of open-ended ranges, so that both the decision under appeal and the preliminary opinion of the board have mainly focused on this issue. Moreover, this discussion has been particularly complex, as it not only involved potential divergences in case law but also addressed whether a question should be referred to the Enlarged Board of Appeal.

8.2.2 Therefore, notwithstanding the parties' submission of written arguments on patentability, the discussion on this issue remains at an early stage. Initiating a detailed discussion for the first time during the oral proceedings would not provide the necessary conditions

for adequately addressing all relevant issues. The board therefore considers that improving procedural economy should not be the decisive factor, as doing so would come at the expense of procedural quality.

8.3 In view of these circumstances, the board has concluded that there are special reasons under Article 11 RPBA that justify the remittal of the case to the first instance for further prosecution.

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 for further prosecution.

The Registrar: The Chairman:

A. Wille J.-M. Schwaller

Decision electronically authenticated