

## Deckblatt Übersetzung

### Daten der Übersetzung:

Court/Gericht:	Bundesgerichtshof
Date of Decision / Datum der Entscheidung:	2021-04-06
Docket Number / Aktenzeichen:	X ZR 54/19
Name of Decision / Name der Entscheidung:	Cerdioxid

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**FEDERAL COURT OF JUSTICE**  
**IN THE NAME OF THE PEOPLE**  
**JUDGMENT**

X ZR 54/19

Pronounced on:  
6 April 2021  
Zöller  
Judicial Secretary as  
Clerk of the court  
registry

in the patent nullity proceedings

Cerdioxid/  
Cerium dioxide

EPC Art. 54; Patent Act Sec. 3

- a) A disclosure excluding novelty is not already given if a citation claims patent protection for a product with certain properties. Rather, it is necessary that the citation directly and unambiguously discloses a concrete technical teaching by which the claimed properties can be achieved.
- b) A direct and unambiguous disclosure in this sense is not given if the citation merely shows a way of realizing an embodiment with other properties. The principle according to which it is not necessary for the executable disclosure of a technical teaching to show a practicable way for realizing every conceivable embodiment is not applicable in this context.

Federal Court of Justice, judgment of 6 April 2021 - X ZR 54/19 –  
Federal Patent Court

ECLI:DE:BGH:2021:060421UXZR54.19.0

The X. Civil Senate of the Federal Court of Justice, following the oral hearing on 6 April 2021, attended by the presiding judge Dr. Bacher, the judges Dr. Grabinski, Hoffmann and Dr. Deichfuß and the judge Dr. Kober-Dehm

ruled that:

On appeal by the defendant, the judgment of the 3rd Senate (Nullity Senate) of the Federal Patent Court of 15 January 2019, is amended, the further appeal being dismissed.

European patent 1 435 338 is declared partially null in that patent claim 1 is given the following wording and the remaining claims refer back to this wording:

A ceric oxide which is an oxide consisting essentially of ceric oxide, and wherein said ceric oxide has a specific surface area of not smaller than 30.0 m<sup>2</sup>/g and not more than 53.2 m<sup>2</sup>/g when subjected to calcination at 900 °C for 5 hours.

The remainder of the plaintiff's claim is dismissed.

The plaintiff shall bear three-fifths and the defendant two-fifths of the costs incurred at first instance.

Of the costs of the appeal proceedings, the plaintiff shall bear four fifths and the defendant one fifth.

By operation of law

Facts of the case:

1           The defendant is the owner of European patent 1 435 338 (patent in suit), which was granted with effect for the Federal Republic of Germany, was filed on 5 September 2002 claiming the priority of a Japanese application dated 7 September 2001 and relates to a cerium oxide, a process for its preparation and a catalyst for exhaust gas purification. The patent in suit comprises nine claims, of which claims 1, 6 and 9 read as follows in the language of the proceeding:

1.    A ceric oxide which is an oxide consisting essentially of ceric oxide, and wherein said ceric oxide has a specific surface area of not smaller than 30.0 m<sup>2</sup>/g when subjected to calcination at 900°C for 5 hours.
6.    A method for preparing a ceric oxide of claim 1, comprising the steps of:
  - (a)   providing a cerium solution not less than 90 mol% of which cerium ions are tetravalent;
  - (b)   holding said cerium solution prepared in step (a) at 60 to 220°C under heating;
  - (c)   cooling said heated cerium solution;
  - (d)   adding a precipitant to said cooled cerium solution so as to make the pH of the solution not lower than 7, to thereby obtain a precipitate; and
  - (e)   calcining said precipitate.
9.    A catalyst for purifying exhaust gas comprising a co-catalyst, wherein said co-catalyst comprises ceric oxide of claim 1.

2           The plaintiff argued that the subject matter of the patent in suit was not patentable and was not disclosed in a manner that would enable a skilled person to carry it out. The defendant defended the patent in suit as granted and, in the alternative, in seventeen amended versions.

3           The Patent Court declared the patent in suit to be null and void. The defendant's appeal challenges this, defending the patent in suit primarily in the version of the first instance auxiliary request 9, alternatively in three further amended versions (auxiliary requests 1 to 3) and further alternatively in the version of the first instance auxiliary request 11 (now auxiliary request A) as well as three amended versions relating thereto (auxiliary requests A1 to A3). The plaintiff counters the appeal.

Grounds of the decision:

4 The admissible appeal is partially successful.

5 I. The patent in suit concerns cerium oxide, a process for its  
production and a catalytic converter for exhaust gas purification.

6 According to the statements in the patent in suit, catalysts for exhaust  
gas purification in vehicles consist of a catalytically active metal such as  
platinum, palladium or rhodium and a cocatalyst for increasing the catalytic  
activity. Both components are applied to a carrier, which can consist of  
aluminum or cordierite, for example.

7 Materials containing cerium oxide are used as the cocatalyst. Cerium  
oxide has the ability to absorb oxygen under an oxidizing atmosphere and to  
desorb oxygen under a reducing atmosphere. Therefore, cerium oxide-  
containing materials convert pollutants such as hydrocarbons, carbon monoxide  
or nitrogen oxides contained in exhaust gases with an extraordinarily high  
degree of efficiency.

8 To trigger the function of the cerium oxide-containing material, the cocatalyst  
would have to be kept at a high temperature. Vehicle manufacturers have so far  
solved this problem by installing catalytic converter systems close to the engine,  
so that the exhaust gases are fed to the catalytic converter system in a hot state  
immediately after leaving the engine.

9 In general, the efficiency of exhaust gas aftertreatment is also  
proportional to the area over which the active layer of the catalyst and the  
exhaust gas come into contact and to the ability of the cocatalyst to store and  
release oxygen.

10 Cerium oxides produced by previously known processes did not have the  
required heat resistance and, after calcination at 900 °C, had a specific surface  
area of at most 15 m<sup>2</sup>/g, which was too low. Cerium oxide-containing oxides with  
increased oxygen storage capacity proposed in the state of the art are not high-  
purity cerium oxides but mixed oxides in which one or more elements are  
dissolved (para. 6).

11           2.     Against this background, the patent in suit concerns the technical  
problem of providing a cerium oxide with high heat resistance, high oxygen  
adsorption and desorption capacity even at low temperatures, and large specific  
surface area even at high temperatures.

12           3.     In order to solve this problem, the patent in suit, in the version of  
claim 1 defended by the main application at second instance, proposes a cerium  
oxide whose features can be divided as follows (changes from the granted  
version are underlined):

1.A    It is an oxide consisting essentially of ceric oxide.

1.B    After calcination at 900 °C for five hours, the specific  
surface area of the ceric oxide is

1.B.a  not less than 30 m<sup>2</sup>/g

1.B.b  and not more than 100 m<sup>2</sup>/g.

13           4.     Claim 6 protects a process, characterized in more detail by five  
features, for preparing a ceria having the features of claim 1, claim 9 protects a  
catalyst for exhaust gas purification with a cocatalyst consisting of a ceria having  
the features of claim 1.

14           5.     Feature 1.A requires further consideration.

15           a)     The term "cerium oxide" refers only to cerium(IV)-oxide (CeO<sub>2</sub>,  
cerium dioxide), but not to cerium(III)-oxide (Ce<sub>2</sub>O<sub>3</sub>).

16           In the German language, "cerium oxide" is indeed used as a generic term  
for both compounds. However, the term "ceric oxide" used in the language of  
the process refers only to cerium dioxide. This meaning is decisive for the  
interpretation of the patent in suit.

17           There is no evidence that the patent in suit uses the term in a different  
meaning.

18           b)     The wording "essentially" is to be understood, as the Patent Court  
correctly assumed, as meaning that other constituents may be present in the  
protected substance, but only in such proportions that they have no significant

effect on the specific surface of the cerdioxide after calcination at 900 °C for five hours.

19           aa)    The description of the patent in suit does not explicitly explain the meaning of the formulation mentioned. However, from the fact that the patent in suit distinguishes in the description of the state of the art between cerium oxides with one or more other elements and high-purity ceric oxides (paragraph 6), it can be deduced that a substance within the meaning of claim 1 consists "essentially" of cerium dioxide only if any other elements present - in contrast to the state of the art - are of no significance for the essential properties of the substance. This leads to the interpretation already taken as a basis by the Patent Court.

20           bb)    As the Patent Court also correctly assumed, no softening of these requirements results from the embodiment example described in the description, in which a cerium solution with a proportion of at least 90 mole percent of tetravalent cerium ions is used as starting material, and from patent claim 6, which takes up this example.

21           It may be inferred from the explanations of the embodiment example and the features of patent claim 6 that a substance which realizes feature 1.A is also obtainable with a starting material of the type mentioned. However, it cannot be inferred from this that a proportion of up to ten mole percent of trivalent cerium or other elements is generally harmless. Feature 1.A does not refer to the starting material used for production, but to the finished product.

22           cc)    Patent claim 9 does not lead to a different understanding of feature 1.A either. The fact that the co-catalyst according to this claim may also comprise other substances does not change the requirements that the cerium dioxide according to patent claim 1 must meet.

23           II.     The Patent Court gave the following main reasons for its decision, insofar as it is still of interest for the appeal proceedings:

24           It could remain undecided whether the technical teaching of patent claim 1 was disclosed in such a way that the skilled person, a chemist with a doctorate and knowledge in the field of catalysis who is engaged in the development of

exhaust gas catalysts, could carry it out. In any case, the subject matter of the patent in suit was not patentable either in the granted version or in the versions defended in the alternative.

25           The features provided for in the granted version of claim 1 were all disclosed in French patent application 2 756 819 (K4). The general part of the description of K4 discloses cerium oxide and cerium-zirconium mixed oxide as equivalent solutions. Claim 1 formulated in K4 referred to both solutions. Claim 6, which provides for a specific surface area of at least 20 m<sup>2</sup>/g, in particular of at least 30 m<sup>2</sup>/g after calcination at 900 °C for six hours, refers to the entire subject matter of patent claim 1. The process claims formulated in K4 also alternatively protect the preparation of cerium oxide and of cerium-zirconium mixed oxides. The fact that K4 did not show an example of an embodiment of cerium oxide did not lead to a different assessment. A special emphasis or emphasis by an embodiment example was not necessary for the novelty-damaging disclosure. This is not contradicted by the fact that cerium-zirconium mixed oxides often have a larger specific surface area than pure cerium oxide, because claim 6 only defines a lower limit. Cerium oxides with a specific surface of more than 30 m<sup>2</sup>/g after calcination at 900 °C were already known to the skilled person from the publications of Terribile et. al. (The Synthesis and Characterization of Mesoporous High-Surface Area Ceria Prepared Using a Hybrid Organic/Inorganic Route, *Journal of Catalysis* 1998, pp. 299-308, K3) and Holmgren et. al. (Interactions of CO with Pt/ceria catalysts, *Applied Catalysis B: Environmental* 1999, pp. 215-230, K5). The defendant had not been able to prove the lack of reworkability of the K4 teaching with respect to cerium oxide, which it had complained about. The test report (B11) submitted by the defendant at most proved the lack of reworkability of the first of three examples described in K4. A direct and unambiguous disclosure of feature 1.B was not lacking because the examples of K4 showed that the specific surface area decreased with decreasing zirconium oxide content in the mixed oxide. The examples also proved the technical teaching of K4 only selectively in this respect.

26           The additional upper limit of 100 m<sup>2</sup>/g provided for in the first instance auxiliary request 9 was not anticipated by (K4). However, it did not concern an

additional technical feature which went beyond the general skill and knowledge of the skilled person and could be regarded as based on inventive step. Accordingly, the subject matter defended by the further auxiliary claims was not patentable either, insofar as these claims merely provided for deviating values for the lower and upper limit of the specific surface.

27           III.     This assessment does not stand up to scrutiny in the appeal proceedings in one decisive point.

28           1.     Contrary to the view of the Patent Court, K4 does not unambiguously and directly disclose a cerium dioxide with features 1.A and 1.B.a. The patent is not based on the following features.

29           a)     K4 discloses compositions based on cerium oxide or on cerium-zirconium mixed oxide in the form of extrudates which can be used as catalysts for exhaust gas aftertreatment in internal combustion engines, as well as processes for the preparation of these extrudates (p. 1 lines 9-11; p. 11 lines 7-9).

30           According to the general information in the description of K4, the claimed compositions are to contain cerium oxide or cerium-zirconium mixed oxide in a proportion of at least 50% by weight. For the compositions based on cerium-zirconium mixed oxide, the proportion of cerium and zirconium could vary within a wide range. The compositions could, if necessary, contain additives known to improve the catalytic properties of cerium or zirconium, in particular the specific surface area or the oxygen storage capacity (p. 2 line 1325).

31           The compositions could also have considerable specific surface areas at high temperatures. Their size would depend on the nature of the constituents. The largest surface areas would be achieved with compositions in which the proportion of zirconium predominated (p. 3 lines 9-12). For compositions with a predominance of cerium, the specific surface area after calcination at 900 °C for six hours could be at least 20 m<sup>2</sup>/g or at least 30 m<sup>2</sup>/g, respectively. Compositions with a predominant proportion of zirconium even had a specific surface area of at least 30 m<sup>2</sup>/g or at least 40 m<sup>2</sup>/g after calcination at 900 °C for six hours. With the addition of additives, the specific surface area could be

further increased (p. 3 lines 13-33).

32 The embodiments described in K4 concern mixed oxides with the following properties:

33

Example	Cerium content	Zirconium content	Specific surface
1 (p. 12 lines 16 ff.)	62 %	38 %	39 m <sup>2</sup> /g
2 (p. 13 lines 1 ff.)	17 %	83 %	45 m <sup>2</sup> /g
3 (p. 13 lines 23 ff.)	75 %	25 %	30 m <sup>2</sup> /g

34 Claim 1 formulated in K4 relates to compositions based on cerium oxide or cerium-zirconium mixed oxides, claim 6 to compositions according to claim 1 which have a specific surface area of at least 20 m<sup>2</sup>/g, in particular 30 m<sup>2</sup>/g, after calcination at 900 °C for six hours.

35 b) Thus, feature 1.A is disclosed in isolation, but not in combination with feature 1.B.a.

36 aa) However, it can be assumed with the Patent Court that feature 1.B.a is not disclosed merely because K4 requires a calcination time of six hours, whereas feature 1.B.a only provides for five hours.

37 According to the findings of the Patent Court, which are not challenged in this respect and are consistent with the information in the description of the patent in suit, the skilled person was familiar with the fact that prolonged exposure to heat tends to lead to a reduction in the specific surface area. In view of this, it was obvious to the skilled person without any additional considerations that the values for the specific surface indicated in K4 are also achieved if the material is calcined for only five hours.

38 bb) Contrary to the opinion of the Patent Court, it is not directly and unambiguously clear from K4 that the lower limits for the specific surface area stated for cerium-zirconium mixed oxides, and thus in particular the value of 30 m<sup>2</sup>/g specified in feature 1.B.a, can also be achieved with cerium oxide when

the processes disclosed there are used.

39           (1)    The statements in the general part of the description and claim 6 formulated in K4 do not make any distinction in this respect. In particular, claim 6 is worded in such a way that it also includes cerium oxides with a specific surface area of more than 30 m<sup>2</sup>/g. However, the fact that K4 thus also claims protection for cerium oxides with features 1.A and 1.B.a is not sufficient for a direct and unambiguous disclosure.

40           (a)    A product with certain features is not already disclosed if a citation claims patent protection for such an embodiment. Rather, it is necessary that the citation directly and unambiguously discloses a concrete technical teaching by which the claimed properties can be realized.

41           (b)    The description of K4 does not directly and unambiguously disclose that cerium oxides with a specific surface area of more than 30 m<sup>2</sup>/g can be produced in the way described in the description without additional measures. The reference in the description that the specific surface area typically increases with increasing zirconium content and that the highest values can be achieved when the proportion of zirconium exceeds the cerium content, indicates rather that the values stated for a specific mixed oxide cannot be transferred without further ado to oxides of other composition and a fortiori not to pure cerium oxide.

42           The correlation thus shown is consistent with the results of the three embodiment examples reproduced above. The value of 30 m<sup>2</sup>/g given for the third embodiment example still meets the requirements of feature 1.B.a. However, the comparison with example 1 shows that lowering the zirconium content from 38% to 25% leads to a reduction of the specific surface area by almost a quarter. Although it cannot be readily expected that there is a proportional relationship in this respect, this also indicates that further lowering of the zirconium content leads to a specific surface area of less than 30 m<sup>2</sup>/g and that no better values can be expected for pure cerium oxide. This in turn is consistent with the fact that claim 6, while specifically emphasizing the value of 30 m<sup>2</sup>/g, specifies a value of 20 m<sup>2</sup>/g as the relevant lower limit.

43           (2)     Nothing else follows from claims 10 and 11, which deal with the extrusion of the products protected under K4 and also refer, inter alia, to claim 6. These claims admittedly concern products obtained by either reacting a cerium salt solution and a base or hydrolyzing an aqueous cerium(IV) solution in an acidic medium. Contrary to the view of the appellant, it does not follow from the fact that claims 10 and 11, unlike claims 7, 8 and 9, do not also refer to cerium-zirconium compounds that cerium oxides with features 1.A and 1.B.a are disclosed directly and unambiguously. Claims 10 and 11 cover such cerium oxides by referring to claim 6, but, like the latter, do not go beyond a mere claim to these cerium oxides and, like the latter, do not disclose a corresponding technical teaching.

44           (3)     The case law of the Senate, according to which it is not necessary for the executable disclosure of a technical teaching under Art. 2 Sec. 6(1) sentence 1 no. 2 German Act on International Patent Conventions to point out a feasible way to realize it for every conceivable embodiment (Federal Court of Justice, order of 11 September 2013 - X ZB 8/12, BGHZ 198, 205 = GRUR 2013, 1210 marginal no. 20 - Dipeptidyl peptidase inhibitors; Judgment of 17 January 2017 - X ZR 11/15, GRUR 2017, 493 marginal no. 36 - Borreliosis assay; Judgment of 12 March 2019 - X ZR 32/17, GRUR 2019, 713 marginal no. 42 - Cerium zirconium mixed oxide I) does not lead to a different assessment, contrary to the opinion of the Patent Court.

45           This case law concerns the question of the extent to which a patent may claim protection for embodiments which are not described in all details in the description on the basis of the technical teaching described in the description against the background of the state of the art. In the case in dispute, on the other hand, the question is whether a specific technical teaching for which the patent in suit seeks protection is already anticipated in a citation. For this question it is not decisive for which area the citation for its part can claim protection when claiming a feature in generalized form due to its disclosure content. Rather, it is decisive whether the citation directly and unambiguously discloses the concrete technical teaching of the patent in suit with the consequence that the patent in suit can no longer claim this for itself due to lack of novelty. A publication may also be detrimental to novelty if the skilled person

can easily get hold of the subject matter of the patent in suit by identical reworking of the methods or embodiments disclosed in the citation in question. Reworkability in this sense concerns the extent to which a disclosure in an earlier publication can affect the validity of a patent. The prior citation in question must therefore be specifically reworkable with respect to the teaching claimed by the patent in suit. The question whether a patent is disclosed so clearly and completely that its technical teaching is practicable, on the other hand, does not concern the disclosure content of an earlier publication in relation to the patent whose validity is to be assessed, but rather the scope of protection which the patent in question can claim on the basis of its disclosure content.

46           cc) Whether the skilled person could obtain a cerium dioxide with features 1.A and 1.B.a by reworking the processes and examples disclosed in K4 does not require a final decision. In any case, a concrete way leading to this goal was not disclosed.

47           From this point of view, the subject matter of the patent in suit would at most have been anticipated by K4 if features 1.A and 1.B.a had inevitably resulted from at least one of the procedures disclosed in K4. This condition is not fulfilled.

48           The plaintiff claims, submitting test reports (K4b to K4d), that the reworking of example 1 (K4b) and the method described as the first method (on a laboratory scale: K4c; in larger quantities: K4d) resulted in a specific surface area of 30.7 m<sup>2</sup>/g, 30.3 m<sup>2</sup>/g and 30.4 m<sup>2</sup>/g, respectively. According to the defendant's submission, which is uncontradicted in this respect and is based on a statement by its employee Dr. B. (B12), the addition of ammonia solution specified in K4 up to a pH value of more than 8 (p. 7 line 35 for the first method) or more than 8.5 (p. 12 line 26 f. for example 1) was implemented in all three tests by setting a pH value of 10. This is indeed formally in accordance with the aforementioned specification. However, the plaintiff does not show what could have given reason to exceed the specified minimum value so far and to select a value of 10. This is particularly important because the specific surface area indicated in all three tests is only slightly above the minimum value claimed by the patent in suit and therefore it cannot be ruled out that even slightly different pH values would have produced a worse result.

49 Additional doubts as to whether the tests were within the range suggested by K4 arise from the fact that the values for the specific surface area essentially correspond to those achieved in K4 with a mixed oxide. As has been pointed out above, the indications in the description of K4 rather suggested that lower values would be obtained if pure cerium oxide were used.

50 2. The subject matter of claim 1 was also not suggested to the skilled person by K4.

51 a) Suggestions to design or modify the procedures disclosed in K4 with regard to the patent claim 6 formulated there in such a way that a specific surface of at least 30 m<sup>2</sup>/g can also be achieved with cerium dioxide are neither indicated nor otherwise apparent.

52 Suggestions in this respect did not arise from K4, if only because the increase in the zirconium content and the addition of additives are emphasized as the means of choice for achieving higher values (K4 p. 2 lines 22-25; p. 3 lines 11-12; lines 17-20; lines 28-32).

53 Also, as stated above, the results of the three embodiments showing that with the reduction of the zirconium content the specific surface area becomes smaller did not lead to the expectation that better values and in particular a minimum value of 30 m<sup>2</sup>/g could be achieved when using pure ceria.

54 b) Nor was there a concrete way suggested to the skilled person which would have enabled him, by reworking the processes and examples disclosed in K4, to produce a cerium dioxide with features 1.A and 1.B.a without any inventive step. An inventive step cannot be denied already if it cannot be excluded that this would have been successful. Rather, a concrete way would have to be apparent by which this goal could have been achieved. This requirement is also not met in the case in dispute. It is not sufficient that the skilled person would have obtained a cerium dioxide with characteristics 1.A and 1.B.a by any means. The plaintiff does not show any reason for the skilled person to modify the examples of K4 in the same way as it was done in the experiments presented in the test reports K4b, K4c and K4d. Against this background, there is no need to take evidence as to whether the skilled person

would have arrived at a specific surface of at least 30 m<sup>2</sup>/g in the ways shown in the test reports.

55           IV.     The contested decision proves to be correct in the result with regard to the main request of the second instance for other reasons (Sec. 119(1) Patent Act).

56           Contrary to the opinion of the appeal, the patent specification does not provide sufficient indications as to how a skilled person can achieve the claimed maximum value of 100 m<sup>2</sup>/g.

57           1.           According to the case law of the Senate, an upwardly open field is only disclosed in an executable manner if the invention is not exhausted in the opening of a specific field, but rather shows a teaching that goes beyond this and can be generalized, which for the first time enables the skilled person to search for further improvement possibilities and to exceed the maximum value specifically shown in the patent (Federal Court of Justice, judgments of 12 March 2019 X ZR 32/17, GRUR 2019, 713 marginal no. 45 - Cerium-Zirconium-Mixed Oxide I; X ZR 34/17, GRUR 2019, 718 marginal no. 26 - Cerium-Zirconium-Mixed Oxide I; judgment of 6 August 2019 - X ZR 36/17 marginal no. 104).

58           The patent in suit does not show a generalizable teaching in this sense.

59           2.     An upwardly limited range is only disclosed in an executable manner if the patent describes at least one concrete example of an embodiment which achieves the claimed maximum value or gives concrete indications as to how a further increase can be achieved on the basis of the examples described.

60           These requirements are also not met in the case in dispute.

61           For the embodiments described in the patent specification, the following values are given for the specific surface after calcination at 900 °C for six hours:

62

Example 1	33,6 m <sup>2</sup> /g
Example 2	36,6 m <sup>2</sup> /g
Example 3	47,7 m <sup>2</sup> /g
Example 4	44,6 m <sup>2</sup> /g
Example 5	42,3 m <sup>2</sup> /g
Example 6	31,1 m <sup>2</sup> /g
Example 7	30,8 m <sup>2</sup> /g
Example 8	40,7 m <sup>2</sup> /g
Example 9	48,0 m <sup>2</sup> /g
Example 10	53,2 m <sup>2</sup> /g
Example 11	50,3 m <sup>2</sup> /g

63

These results do give an indication of how the claimed minimum value of 30 m<sup>2</sup>/g can be exceeded by more than two thirds. However, they do not indicate which measures could be suitable for almost doubling the maximum value of 53.2 m<sup>2</sup>/g again.

64

V. The case is ripe for final decision (Sec. 119(5) sentence 2 Patent Act).

65

1. Like the main request, the auxiliary requests 1, 2 and 3 provide for a value range of 30 m<sup>2</sup>/g to 100 m<sup>2</sup>/g and are therefore not to be assessed differently.

66

2. The subject matter defended by the first-instance auxiliary request 11 and the present auxiliary request A, which is limited to a cerium oxide with a specific surface area in the range of 30 m<sup>2</sup>/g to 53.2 m<sup>2</sup>/g, proves to be legally valid.

67

a) As has already been explained above, the patent specification in dispute in embodiment 10 shows a concrete way in which this maximum value can be achieved.

68

b) The subject matter defended by auxiliary request A is patentable.

69

aa) This subject matter is neither anticipated nor suggested by the

publication of Rocchini et al. (Relationships between Structural/Morphological Modifications and Oxygen Storage-Redox Behaviour of Silica-Doped Ceria, Journal of Catalysis 2000, 461478, B4).

70 (1) B4 reports on a study to investigate the behavior of ceria-silica mixed oxides in reducing and oxidizing atmospheres (p. 462 left column middle).

71 Regarding the results of the study, B4 states that silica-doped ceria with a large surface area exhibits better reducing behavior, which increases the ability to store or release oxygen. This is of importance when the materials are exposed to high temperatures (p. 473 under "Discussion"). With a silicon content of more than 3% by weight, the reduction behavior is positively influenced in a similar way as previously observed with zirconia (p. 477 under "Conclusions").

72 Among the materials used to conduct the study, pure cerium oxide is also listed. For this, a specific surface area of 77 m<sup>2</sup>/g is reported (p. 462 Table 1).

73 (2) Thus, in any case, there is no disclosure of feature 1.B.

74 It can be left open whether the values stated in Table 1 indicate the specific surface before or after calcination. Even if the latter is assumed in favor of the plaintiff, it would only result from this that the values mentioned were obtained after a two-hour calcination with an initial temperature of 450 °C and a final temperature of 900 °C reached after 45 minutes. Contrary to the opinion of the plaintiff, no reliable conclusions can be drawn from this regarding the question of what specific surface area would have resulted if the temperature of 900 °C had been maintained not only for 75 minutes but for five hours.

75 (3) B4 also does not suggest the subject matter defended by auxiliary claim A.

76 As explained, B4 is mainly concerned with the reduction properties when doped with silicon oxide. The pure cerium oxide served for this only as starting and comparison material. This did not give rise to any suggestion to use pure cerium oxide to improve material properties in deviation from the approach pursued in B4.

77           bb) The subject matter defended by auxiliary request A is also not anticipated or suggested by the publication of Holmgren et. al. (Interactions of CO with Pt/ceria catalysts, Applied Catalysis B: Environmental 1999, pp. 215-230, K5).

78           K5 discloses a cerium oxide called "Cerium oxide 99.5 H.S.A. 514" (K5 p. 216 at 2.1), which is shown in Exhibit B6b to contain silicon oxide at 0.85 percent by weight. As also the appellant's rejoinder does not doubt, the addition of silicon oxide even in small quantities has an influence on the specific surface of cerium oxide. In view of this, notwithstanding the low percentage by weight, a cerium oxide within the meaning of feature 1.A is not disclosed.

79           A suggestion to refrain from adding silicon did not result from K5.

80           cc) Nothing else applies with regard to US patent specification 5 529 969 (K6).

81           K6 discloses a cerium oxide with a silicon oxide content. This amounts to less than 1% by weight. However, K6 emphasizes that it is the silicon oxide content that stabilizes the specific surface (Abstract and column 10 lines 15-17). Accordingly, feature 1.A is also neither disclosed nor suggested by K6.

82           dd) The subject matter defended by auxiliary request A is also not anticipated or suggested by US patent specification 5 712 218 (K7).

83           K7 relates to cerium-zirconium mixed oxides. As embodiment 5, a mixed oxide with a zirconium content of 17% is disclosed, the specific surface area of which is stated to be 30 to 33 m<sup>2</sup>/g after calcination at 900 °C for six hours.

84           This also means that feature 1.A is not disclosed. From K7, there was no reason to dispense with the addition of zirconium in deviation from the approach disclosed there.

85           ee) Finally, the subject matter defended by auxiliary request A is also not anticipated or suggested by US patent specification 5 891 412 (K18).

86           (1) K18 discloses oxides consisting essentially of cerium oxide. The specific surface area after calcination at 800 to 900 °C for two hours is stated to

be at least 15 m<sup>2</sup>/g.

87 (2) Thus, K18 discloses feature 1.A, but not feature group 1.B.

88 (3) The test reports submitted by the plaintiff on reworkings of Example 1 disclosed in K18 (K19 and K30) are not capable of supporting the conclusion with the certainty required for judicial persuasion under Sec. 286 Code of Civil Procedure that the skilled person would have obtained a cerium oxide with the features of patent claim 1 by identical reworking or a suggested modification.

89 There are already doubts as to whether the tests documented in K19 and K30 took place under conditions corresponding to those that would have existed if K18 had been reworked before the priority date. For example, in the experiment documented in K19 and K30, the plaintiff mixed a cerium nitrate solution with an ammonium carbonate solution to prepare the starting solutions and thus did not use any of the bases expressly mentioned as usable in K18. In example 1 of K18, a colloidal dispersion was formed after the ammonia solution provided there as base had been added to the cerium nitrate solution (K18 column 18 lines 20-25). In contrast, it is clear from K19 that a solution was formed after the ammonium carbonate solution was added to the cerium nitrate solution.

90 Furthermore, there is doubt as to whether the product obtained with the experiment documented in K19 is the same as the product obtained according to Example 1 of K18. K19 does not contain information comparable to Table 1 of K18 regarding the parameters of the product obtained.

91 Finally, the analysis of the product obtained from the post-processing of K18, submitted as B18, indicates that it contains only a cerium content of 70.4 or 70.9 percent by weight and thus cannot be considered a cerium oxide within the meaning of characteristic 1.A.

92 VI. The decision on costs is based on Sec. 121(2) Patent Act and Sec. 92(1) and Sec. 97(1) Code of Civil Procedure.

Deichfuß

Kober-Dehm

Previous instance:

Federal Patent Court, judgment of 15 January 2019 – 3 Ni 46/16 (EP) –