

Deckblatt Übersetzung

Daten der Übersetzung:

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|--|---------------------------|
| Court/Gericht: | Bundesgerichtshof |
| Date of Decision / Datum der Entscheidung: | 2019-03-12 |
| Docket Number / Aktenzeichen: | X ZR 32/17 |
| Name of Decision / Name der Entscheidung: | Cer-Zirkonium-Mischoxid I |





FEDERAL COURT OF JUSTICE

IN THE NAME OF THE PEOPLE

JUDGMENT

X ZR 32/17

Pronounced on:
12 March 2019
Anderer
Judicial Secretary
as Clerk of the
Court Registry

in the patent nullity proceedings

Cer-Zirkonium-Mischoxid I/
Cer-Circonium mixed oxide I

German Act on International Patent Conventions Art. II Sec. 6(1) sentence 1 no. 2

a) A range of values limited only in one direction may be disclosed in an executable manner if the invention is not exhausted in the opening of a certain range, but shows a generalizable teaching going beyond it, which for the first time enables the skilled person to search for further possibilities of improvement and to exceed the maximum value specifically shown in the patent.

b) This requirement is not met if the patent merely provides a new process by which a substance known in the state of the art can be produced with improved properties.

EPC Art. 54(2); Code of Civil Procedure Sec. 286 E

a) The result of an experiment carried out after the priority date can only have an indicative effect for the assessment of the question which substance the skilled person would have obtained before the priority date by identical or obvious reworking of a process disclosed in the state of the art.

b) In accordance with the general principles of civil procedural law, such circumstantial evidence can also only be considered to be established in patent nullity proceedings if

the court is convinced that the circumstantial facts presented are correct and that they allow the conclusion to be drawn with the certainty required under Sec. 286 Code of Civil Procedure that the main fact put in evidence is correct.

Federal Court of Justice, judgment of 12 March 2019 – X ZR 32/17 – Federal Patent Court

ECLI:DE:BGH:2019:120319UXZR32.17.0

The X. Civil Senate of the Federal Court of Justice, following the oral hearing on 12 March 2019, attended by the presiding judge Prof. Dr. Meier-Beck, the judges Gröning, Dr. Bacher and Hoffmann as well as 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 27 September 2016, is amended, the further appeal being dismissed.

European patent 605 274 is declared null insofar as its claim 1 is given the following wording and the references back to claim 1 in claims 2 to 9 refer to this wording:

Composition à base d'un oxyde mixte de cérium et de zirconium, caractérisée en ce qu'elle se présente sous la forme d'une phase cristalline cubique unique d'oxyde cérique, le zirconium étant en solution solide dans l'oxyde de cérium, et en ce qu'elle présente une surface spécifique après calcination à 800°C pendant 6 heures entre 30 m²/g et 57 m²/g.

The remainder of the action is dismissed.

Three quarters of the costs of the legal dispute shall be borne by the plaintiff and one quarter by the defendant.

By operation of law

Facts of the case:

1 The defendant is the owner of European patent 605 274 (patent in suit), which was granted with effect for the Federal Republic of Germany, was applied for on 15 December 1993, claiming the priority of a French application of 21 December 1992, relates to a composition based on a cerium-zirconium mixed oxide and comprises a total of 24 patent claims.

2 Claim 1, to which eight further claims are referred back, reads in the language of the process:

Composition à base d'un oxyde mixte de cérium et de zirconium, caractérisée en ce qu'elle se présente sous la forme d'une phase cristalline cubique unique d'oxyde cérique, le zirconium étant en solution solide dans l'oxyde de cérium, et en ce qu'elle présente une surface spécifique après calcination à 800°C pendant 6 heures d'au moins 30 m²/g.

3 The plaintiff, who is being sued by the defendant for infringement of the patent in suit, has challenged the patent to the extent of claims 1 to 9 on the grounds that the invention is not disclosed in such a way that a skilled person can carry it out, and that the subject matter of the patent goes beyond the content of the documents originally filed and is not patentable. The defendant defended the patent in suit as granted and, in the alternative, in an amended version.

4 The Patent Court declared the patent in suit null to the extent challenged. The defendant appeals against this decision and defends the patent in suit with its first-instance claims and three additional auxiliary claims. The plaintiff counters the appeal.

Grounds of the decision:

5 The admissible appeal is unfounded with regard to the main claim, but well-founded with regard to the first auxiliary claim.

6 I. The patent in suit relates to a composition based on a cerium-zirconium mixed oxide.

7 1. According to the statements in the patent specification, cerium oxide and zirconium oxide were known in the state of the art as suitable components of catalysts, in particular also of three-way catalysts for the decomposition of carbon monoxide, hydrocarbons and nitrogen oxides in the exhaust gas of internal combustion engines. There were many indications that the combined use of both substances would be particularly advantageous. Various attempts had been made to use mixed oxides. This requires a material with the largest possible surface area and high temperature resistance. To obtain such mixed oxides, calcination or annealing at more than 1000°C is necessary. Because of this high temperature, the specific surface area would not be above 10 m²/g, and generally even below 5 m²/g.

8 Against this background, the patent in suit concerns the technical problem of providing a mixed oxide of cerium and zirconium with high temperature resistance and large surface area.

9 2. To solve this problem, the patent in suit proposes, in claim 1, a composition whose characteristics can be divided as follows:

1. The composition is based on a cerium-zirconium mixed oxide.

2. The composition is in the form of a pure cubic crystalline phase of cerium oxide, with zirconium in solid solution.

3. After calcination at 800°C for six hours, the specific surface area is at least 30 m²/g.

10 3. Characteristics 2 and 3 require further consideration.

11 a) A cubic crystalline phase is a crystal lattice with a cubic basic structure.

12 Crystalline cerium oxide (CeO_2) exhibits this structure, in an arrangement that also occurs in fluorite (fluorspar, CaF_2) and is therefore also called fluorite lattice.

13 b) A solid solution in the sense of characteristic 2 is a mixture of two solids in homogeneous form.

14 In the case of crystals, the atoms of the two substances must form a uniform crystal lattice for this purpose. A heterogeneous mixture, on the other hand, exists if the two substances form separate particles which are mixed together.

15 c) Feature 3, as the Patent Court correctly pointed out and without objection by the appeal, does not contain a requirement for the manufacturing process, but only a requirement for the material properties.

16 The background for this is the fact, also mentioned in the description of the patent in suit, that calcination generally leads to a reduction of the specific surface. On this basis, feature 3 specifies that the specific surface area of the composition is still at least $30 \text{ m}^2/\text{g}$ even after it has been calcined at 800°C for six hours. This property forms an indication that the composition is suitable for the intended purpose, because the operating temperature of a catalyst can reach a comparable value.

17 In contrast, whether the composition is actually subjected to the temperature conditions mentioned during the manufacturing process or during operation is not of direct significance. However, it usually follows from feature 3 that the specific surface area must be significantly greater than $30 \text{ m}^2/\text{g}$ before a calcination process of the kind mentioned, because calcination typically leads to a reduction in the surface area. However, such a composition is also and a fortiori suitable for use in a catalyst if it is subjected to less stringent conditions during manufacture and operation.

18 d) Contrary to the view of the appellant, it cannot be inferred from patent claim 1 that the structure defined in feature 2 must also be present only after calcination at 800°C for six hours.

19 According to the wording of patent claim 1, the requirement "après calcination à 800°C pendant 6 heures" refers only to the properties defined in feature 3, but not to the properties defined in feature 2.

20 This distinction is consistent with the fact addressed by the Patent Court that the properties defined in feature 2 - unlike the specific surface area - are not lost by prolonged calcination at high temperatures, but rather are favored.

21 II. The Patent Court essentially justified its decision as follows:

22 It could remain undecided whether the general teaching of calcination for six hours at 800°C was disclosed in the originally filed documents as belonging to the invention and whether the technical teaching of patent claim 1 was disclosed in such a way that the skilled person, a chemist with a doctorate and experience in the development of exhaust gas catalysts, could carry it out. In any case, the challenged subject matter was not patentable.

23 It could be left open whether the accused subject matter was fully disclosed in US patent specification 4 940 685 (K4) or in the publication by Fu-k'ang et al. (Zirconates of the rare earth elements and their physicochemical properties, Russian Chemical Bulletin, 1964, 1070 to 1075, K16) or whether the examples described there were identically reworked with the experiments documented in K5, K18 and K12. In any case, the subject matter mentioned was suggested by the publication of Matsumoto et al. (The Effect of Complex Oxides in Ce-La and Ce-Zr Systems on Thermal Resistant Automotive Three-Way Catalyst, Catalytic Science and Technology, 1991, 335 to 338, K10), K4 and the general expert knowledge.

24 The skilled person is familiar with three-way catalysts from K10, which are composed of complex oxides of the Ce/Zr system. From this system, the skilled person knew that the incorporation of zirconium into the crystal lattice of the cerium oxide increased the thermal stability and that such mixed oxides were present in the form of a solid solution with a purely cubic-crystalline

structure. The skilled person considered the temperatures of 1200°C used in K10 for production to be disadvantageous because they led to the fusion of pores and thus to a small specific surface area. In the search for improvement possibilities, the skilled person would refer to citation K4 and there primarily to embodiment example 2. This shows that temperatures of maximum 400°C are sufficient to obtain mixed oxides which still have specific surfaces of 50 m²/g and 10 m²/g respectively after calcination at 700°C and 900°C for six hours. Even if the skilled person does not obtain any information about the crystallographic properties from K4 and, knowing K10, has to assume that the desired solid solution with a purely cubic crystal structure is not present due to the low temperatures, he will not overlook the similarities of the mixed oxides disclosed in the two citations. This, he said, would cause him to reconsider the principle that temperatures of at least 1000°C were required to obtain a true mixed oxide with the properties defined in feature 2. On a more detailed study of the phase diagram, he would come to the conclusion that these properties could also be present at temperatures of 400°C, provided that a suitable quantitative ratio existed.

25 With regard to the subject matter of claims 2 to 9 and the subject matter defended by the first-instance auxiliary request, nothing to the contrary applies.

26 III. This assessment does not stand up to review in the appeal proceedings.

27 Contrary to the opinion of the Patent Court, the subject matter of the granted version of patent claim 1 is not suggested to the skilled person by K10, K4 and the general technical knowledge.

28 1. K10 describes experiments with mixed oxides based on cerium and lanthanum or cerium and zirconium. The aim of the investigation, which is described as basic research, is stated to be an improvement in the thermal resistance of catalytic converters for automobiles in comparison with cerium oxide (CeO₂). The studied oxides were prepared using aqueous solutions of ceritrate, lanthanum nitrate and zirconyl nitrate. The samples were first heated to 600°C and then to temperatures up to 1200°C. X-ray diffraction was used to

analyze the phases and stoichiometric ratios. For mixtures of cerium oxide and zirconium oxide ($\text{CeO}_2\text{-ZrO}_2$), the following phases are described in Table 1:

| $(\text{Ce}_{1-x}, \text{Zr}_x)\text{O}_2$ | |
|--|--|
| x | Phase |
| 0 | CeO_2 |
| 0,1 | CeO_2 s.s. |
| 0,2 | CeO_2 s.s. |
| 0,3 | CeO_2 s.s. + C_2 |
| 0,4 | CeO_2 s.s. + ZrO_2 s.s. + C_2 |

* s.s.: solid solution, C_2 : cubic fluorite-type oxide

29 From these data, it is deduced that a solid solution of the formula $(\text{Ce}_{1-x}, \text{Zr}_x)\text{O}_2$ ($x < 0.2$), complex oxides and a zirconium-rich solid solution of the formula $(\text{Zr}_{1-x}, \text{Ce}_x)\text{O}_2$ formed in $\text{CeO}_2\text{-ZrO}_2$ systems. The lattice constant of the first-mentioned solution decreased with the zirconium content. The reason for this was said to be the difference in the size of the cations in solid oxide solutions with the same fluorite-type structure.

30 Further investigations lead to the conclusion that the addition of zirconium improves the thermal stability and increases the CO-activity.

31 2. Whether this discloses a purely cubic crystalline phase of ceria with zirconium in solid solution, at least for some of the mixtures examined, can be left open. Contrary to the opinion of the Patent Court, there was in any case no reason for the skilled person to carry out the manufacturing process disclosed in K10 at lower temperatures in order to achieve a larger specific surface area.

32 a) According to the findings of the Patent Court, a process is disclosed in K4 by which a relatively large specific surface can be achieved. However, no information on the crystallographic properties of the cerium-zirconium mixed oxides disclosed therein is obtained from K4. The low temperatures disclosed in K4 even tended to suggest on the priority date that the mixed oxides produced there do not have the structure defined in feature 2.

33 Against this background, even in the opinion of the Patent Court, the skilled person could only arrive at the teaching protected by the patent in suit if he fundamentally reconsidered the findings on temperature and crystal structure derived from K10 and K4.

34 b) Contrary to the opinion of the Patent Court, K10, K4 and the general technical knowledge did not give the skilled person any reason to make such far-reaching and fundamental considerations.

35 It can be assumed with the Patent Court that the skilled person had reason to increase the specific surface of compositions of the kind disclosed in K10. Even with this starting position, the fact that both in K10 and in K4 the increased thermal stability of cerium-zirconium mixed oxides compared to ceria is justified by the incorporation of zirconium into the ceria crystal lattice, did not give any concrete indication that precisely a uniform phase with a cubic-crystalline form is the decisive means by which the said objective can be achieved. Even if the skilled person had had reason to consider this structure as particularly promising for the reasons set out in the introduction to the patent in suit, this also did not give rise to any reason to fundamentally reconsider the ways of creating such a structure disclosed in the state of the art, to deal with the fundamental question at which temperature and mixing ratios such a phase can form, and to develop a completely new approach on this basis.

36 c) Contrary to the view of the appellant's rejoinder, the subject matter of patent claim 1 is also not obvious because, in the case of a composition as described in K4, a solid solution within the meaning of feature 2 forms in any case after a calcination at 800°C.

37 It can be left open what information on the required minimum temperature was available to the skilled person from the publication by Tani et al. (Revised Phase Diagram of the System ZrO_2-CeO_2 below 1400°C, Journal of the American Ceramic Society, 1983, 506-510, BK4) and the other expert knowledge. Even if it could be inferred from this that a solid solution is already formed at temperatures significantly below 1000°C, the skilled person could only have come to this conclusion if he had fundamentally reconsidered the manufacturing processes disclosed in the state of the art, as the Patent Court

assumed. However, there was no reason for the skilled person to do so for the reasons already explained.

38 IV. The contested decision proves to be correct with regard to the granted version of the patent in suit for other reasons.

39 The fact that no upper limit for the specific surface is specified in feature 3 has the consequence that the invention claimed with the granted version is not disclosed in such a way that a skilled person can carry it out.

40 1. According to the case law of the Federal Court of Justice, it is not generally necessary for a feature claimed in a generalized form that the patent specification shows the skilled person a feasible way to realize it for every conceivable embodiment.

41 If, for example, a process step claimed "generically" is considered to belong in its general meaning to the problem solution according to the invention, it is sufficient in principle if a specific embodiment is disclosed in an executable form. The situation may be different, however, if an open area is defined by two mutually opposing parameters without the barriers resulting from the interaction of the parameters being disclosed. Then the proposition claims validity that the possible patent protection is limited by the contribution to the state of the art. In such cases, the executable disclosure covers only those areas in which the executability results from the disclosed measures or measures familiar to the skilled person or in which it is at least plausible, in particular in the case of selective disclosures (Federal Court of Justice, judgment of 25 February 2010 - Xa ZR 100/05, BGHZ 184, 300 = GRUR 2010, 414 marginal no. 23 - Thermoplastic Composition).

42 The assessment of this question always requires an evaluative consideration. The degree of generalization that is permissible in this context depends in each individual case on whether the protection afforded by the respective version of the claim is within the scope of what can be inferred from the patent from the point of view of a skilled person, taking into account the description and the embodiment examples contained therein, as the most general form of the technical teaching by which the problem underlying the

invention is solved (Federal Court of Justice, judgment of 11 September 2013 - X ZB 8/12, BGHZ 198, 205 = GRUR 2013, 1210 marginal no. 21 - Dipeptidyl peptidase inhibitors; judgment of 17 January 2017 - X ZR 11/15, GRUR 2017, 493 marginal no. 36 - Borreliosis assay).

43 2. In the case in dispute, the invention is accordingly not disclosed in an executable manner.

44 a) However, this does not already follow from the fact that the claimed range is open on one side and therefore theoretically extends to infinity.

45 A range of values limited only in one direction can be disclosed in an executable manner according to the principles outlined above, if the invention is not exhausted in the opening of a certain range, but shows a generalizable teaching going beyond this, which for the first time enables the skilled person to search for further possibilities of improvement and to exceed the maximum value specifically shown in the patent. If these conditions are met, a subsequent invention which uses the approach pointed out by the patent and leads to further improvements by additional or modified measures is based on the contribution which the patent has made to the state of the art.

46 b) However, the patent in suit does not show a generalizable teaching in this first sense. Contrary to the view of the defendant, it has not made available for the first time single-phase mixed cerium-zirconium oxides with the specific surface area defined in feature 3, but merely a new process by which such mixed oxides with improved properties can be produced.

47 As already stated above in connection with K10, mixed oxides having a cubic crystalline phase of cerium oxide with zirconium in solid solution were known at the priority date. It is true that the patent in suit has contributed to the state of the art in so far as it has shown that it is not necessary to use the high temperatures disclosed in K10 to produce such structures with a specific surface area meeting the requirements of feature 3. In so doing, however, it has not provided a new class of mixed oxides, nor has it shown any other generalizable teaching that would enable one skilled in the art to further increase the specific surface area independently of the method of preparation disclosed in the patent

in suit. Thus, a subsequent invention that enables further improvement independent of this manufacturing process is not based on the contribution that the patent in suit has made to the state of the art. Therefore, in the required evaluative consideration, only that area is to be regarded as disclosed as executable which can be achieved with the disclosed process.

48 c) Contrary to the - possibly misleading - considerations of the Patent Court, the invention is also not executably disclosed because, according to feature 3, the specific surface which results after calcination at 800°C for six hours is decisive.

49 As has been pointed out above, such a treatment generally results in the specific surface area decreasing. This may, as the Patent Court considered, mean that the maximum value of the specific surface that can be achieved in practice is subject to certain limits. However, this does not result in an approach for the skilled person to further increase the specific surface area, but rather in an obstacle that makes the achievement of this goal even more difficult.

50 V. The matter is ready for final decision.

51 The subject matter defended by auxiliary claim 1, which is limited to compositions with a specific surface area in the range of 30 m²/g to 57 m²/g, proves to be legally valid.

52 1. Contrary to the opinion of the appellant's reply, the subject matter claimed in this auxiliary request does not go beyond the content of the documents originally filed.

53 This is not contradicted by the fact that the claimed value of 57 m²/g is not defined as an upper limit for the specific surface either in the description of the application or in the claims formulated therein. That a composition with such a large specific surface area is disclosed as belonging to the invention follows from the explanations already contained in the application concerning the various embodiment examples, in which different values are given for the specific surface area, covering the range from 30 m²/g up to the value of 57 m²/g given in embodiment example 5. Thus, a range is sufficiently clearly indicated for which the invention claims a contribution going beyond the state of the art.

54 The fact that the said value could not be achieved in the other
embodiments disclosed in the application does not lead to a different
assessment. For the direct and unambiguous disclosure as belonging to the
invention, it is sufficient if an embodiment example is shown in which all features
provided for in the patent claim are realized.

55 2. The invention claimed by auxiliary claim 1 is disclosed in such a
way that a skilled person can carry it out.

56 a) As has already been pointed out, the claimed maximum value for
the specific surface area corresponds to the value disclosed in the description
of embodiment 5 (para. 65 ff.). Thus, the skilled person has been shown a
feasible way for the entire claimed area.

57 b) Contrary to the opinion of the appellant's rejoinder, an executable
disclosure is not lacking because the measuring method according to the ASTM
D 3663-78 standard cited in the description of the patent in suit (Sp. 3 lines 36-
43), which is based on the procedure first proposed by Brunauer, Emmet and
Teller (BET) in 1938, would have to be regarded as unsuitable.

58 (1) According to the findings of the Patent Court, the BET method is
also used in practice for catalysts whose adsorption isotherms cannot be
assigned to types II or IV.

59 The appellant's rejoinder does not cast doubt on this finding.
Circumstances which could speak for a deviating assessment are also not
otherwise evident.

60 In particular, the finding of the Patent Court does not contradict the
passage quoted by the appellant in the introductory remarks of the standard (K2
p. 1140 at 1.1), according to which the standardized method covers the
determination of the specific surface of catalysts of types II or IV. It may follow
from these remarks that the method complies with the standard only for these
two types. However, it cannot be inferred from them that it would be unsuitable
for other types.

61 (2) The fact, emphasized by the appellant, that the BET method yields too low measured values for certain types of isotherms because the nitrogen atoms used to determine the surface do not penetrate into every pore, does not prevent the suitability of this method for the purpose envisaged in the patent in suit.

62 The patent in suit is concerned with achieving the greatest possible specific surface area. In order to be able to verify the achievement of this goal, a measuring method is required which provides sufficient certainty that the surface area actually present is not smaller than the measured value indicates. The BET method also meets this requirement in the constellations in question here. The possibility, which cannot be excluded, that the actually existing surface even exceeds the measured value does not represent a practically relevant disadvantage for the intended use presupposed by the patent in suit.

63 (3) Contrary to the opinion of the appellant's rejoinder, the fact that the BET method or the standard ASTM D 3663-78 are not explicitly mentioned in the patent claims does not prevent the practicability.

64 It may follow from the fact that the patent claims do not refer to a specific measuring method that it is not mandatory to use the method indicated in the description. However, especially if several methods are considered which lead to fundamentally different results, the information in the description is of decisive importance in order to substantiate the specifications in the patent claims which are not sufficient in themselves. In the present context, this does not necessarily mean that only a measurement according to ASTM D 3663-78 is possible. However, another method may only be used if, according to its specifications, essentially the same results can be expected.

65 c) The objection raised at first instance that the subject matter of the patent in suit goes beyond the content of the documents originally filed because the application (as well as the patent specification) does not disclose calcination at 800°C for six hours in all embodiments was not addressed by the plaintiff in its appeal. It is not well-founded on the basis of the considerations already made by the Patent Court.

66 3. The subject matter defended by auxiliary request 1 is patentable.

67 a) The test reports and explanations submitted by the plaintiff on reworkings of the embodiment example 2 disclosed in K4 (K5, K5a, K5b, K18, K18a) are not capable of supporting the conclusion with the certainty required for the judicial formation of conviction under Sec. 286 Code of Civil Procedure that the skilled person would have obtained a composition with the features of patent claim 1 by identical reworkings of this example or an obvious variation.

68 aa) The question of which compositions the skilled person would have obtained before the priority date by identical or obvious reworkings of the said example can only be assessed in the dispute on the basis of circumstantial evidence.

69 Direct evidence would only be possible if there were indications that it had already been possible to obtain a composition in conformity with the patent by such reworkings before the priority date. Such indications are neither presented nor otherwise evident.

70 The test results presented by the plaintiff are unsuitable for direct evidence because the documented tests took place after the priority date. Particularly in view of the considerable time lag to the priority date in 1992, the results of these tests can only constitute an indication that essentially the same results would have been obtained before the priority date.

71 bb) In accordance with the general principles of civil procedural law, circumstantial evidence can only be regarded as having been established if the court is convinced that the circumstantial facts presented are correct and that they allow the conclusion to be drawn with the certainty required under Sec. 286 Code of Civil Procedure that the main fact put in evidence is correct. Before taking evidence, the trial judge may and must therefore examine whether the circumstantial evidence is conclusive, i.e. whether the totality of all the circumstantial evidence presented - assuming it is correct - would convince him of the truth of the main fact (Federal Court of Justice, judgment of 25 October 2012 - I ZR 167/11, NJW-RR 2013, 743 marginal no. 26; judgment of 8 May 2012 - XI ZR 262/10, BGHZ 193, 159 marginal no. 45).

72 These principles are also relevant for patent revocation proceedings.

73 Unlike in civil proceedings, the principle of official investigation applies in patent revocation proceedings. In the present context, however, this principle can only lead to the fact that the court may also have to take into account circumstantial facts in its assessment which have not been submitted by any party, provided that other circumstances give rise to corresponding indications. The assessment as to whether the facts presented and other circumstantial facts in their entirety lead to the conclusion that the main facts are correct must, on the other hand, be carried out in the same way.

74 cc) In the case in dispute, the circumstantial evidence pointed out by the plaintiff is not sufficient to support beyond doubt the conclusion that the skilled person would have obtained a composition with features 2 and 3 by reworking embodiment example 2 disclosed in K4 before the priority date. Additional indications that could lead to a different assessment are not apparent. Therefore, there is no need to take evidence on the circumstantial facts presented by the plaintiff.

75 It can be left open to what extent the deviations in the execution of the tests criticized by the defendant in the first instance were causal for the documented result. As the defendant rightly asserts, there are in any case serious doubts about the informative value of the documented tests because the value given for the specific surface area after six hours of calcination at 900°C of 24 m²/g (K5 p. 3) or 27.2 m²/g (K18) is significantly higher than the value of 10 m²/g disclosed in K4 (K4 Sp. 9 Z. 4) and because the diagrams reproduced in the test reports do not allow the conclusion with sufficient certainty that a purely cubic-crystalline phase of cerium oxide with zirconium is present in solid solution.

76 (1) The striking deviations with regard to the specific surface after calcination at 900°C for six hours justify doubts as to whether the documented tests were carried out as would have been obvious to the skilled person on the priority date.

77 The values documented in the test reports are more than double the value given in K4 and are even close to the value claimed by the patent in suit for calcination at 800°C for six hours. This makes it seem possible that the tests documented in K5 and K18 unintentionally took place under conditions that do not correspond to those that would have existed if K4 had been reworked before the priority date. The deviation can theoretically also be based on an incorrect measurement or reproduction in K4. However, this possibility seems unlikely if only because the measured values for 400°C, 550°C and 700°C, insofar as they are given in the test reports, essentially agree with the values given in K4.

78 Contrary to the plaintiff's view, against this background it is not up to the defendant to point out possible other causes that could explain the deviation that occurred. Rather, it is the task of the court to assess on the basis of the facts of the case whether the conclusions derived by the plaintiff from the test reports can be regarded as correct with sufficient certainty, i.e. whether no relevant doubts remain which could contradict this conclusion. Such doubts cannot be completely dispelled in the case in dispute.

79 (2) Additional doubts arise from the fact that the diagrams reproduced in the test reports (K5 p. 4; K5b p. 3 and 4; K18; K18a Annex A), in which the results of investigations of the crystal structure by means of X-ray diffraction (XRD) and Raman spectroscopy are shown, and the explanations relating thereto do not readily permit the conclusion that the compositions produced consist of a single phase.

80 As the defendant explained uncontradicted in the oral hearing before the senate on the basis of figures 5 and 6 of the patent in suit, the presence of a second phase consisting of zirconium oxide (ZrO_2) can be recognized in such diagrams by means of deflections (peaks), the height of which is clearly smaller than that of the deflections caused by the first phase. In the case of the documented reworkings, even a significantly lower height is to be expected than in Figure 6 of the patent in suit, because the proportion of zirconium oxide in the tests in K5 and K18 is only 2.5%, whereas in the test described in the patent in suit it is 30%.

81 Against this background, based on the information in the test reports, it is indeed possible that the composition obtained consists of only one phase. However, the resolution chosen for the representation is so low that the existence of a second phase cannot be excluded with certainty.

82 (3) Whether the two circumstances pointed out would in each case in themselves raise relevant doubts about the conclusion postulated by the plaintiff can be left open. At any rate, in their entirety, they impair the circumstantial value of the documented tests to such an extent that the Senate is not able to come to the conclusion that the skilled person would have obtained a composition with features 2 and 3 by an identical or suggested reworking of K4 before the priority date.

83 b) The same applies to the report on the reworking of the experiment for the preparation of cerzirconate in air atmosphere (K12) disclosed in K16 and described there as having failed.

84 aa) It can be left open whether the disclosure or at least a suggestion for the production of a cerium-zirconium mixed oxide results from K16, although the experiments described there serve the production of cerium zirconate.

85 It is true that K16 states that cerium zirconate decomposes to the tetravalent form upon oxidation of the trivalent cerium, whereby cerium oxide (CeO_2) and zirconium oxide (ZrO_2) could react to form a fluorite-type solid solution. As a further possibility, however, the reaction of the two oxides with the compound itself to form a solid solution of the pyrochlore type is described and it is stated that the distinction of these reaction products in the X-ray pattern is very difficult because of the great similarity of the structures (K16 p. 1073 at figure 4).

86 bb) Irrespective of this, the statements in K21 do not allow the conclusion that a reworking of K16 without knowledge of the invention would have led to a composition according to the invention, because K16 does not disclose any further details on experimental parameters such as quantity ratios, processing method and temperature control.

87 c) Contrary to the opinion of the appellant, the subject matter of patent claim 1 is not suggested by the Japanese disclosure Hei 4-55 315 (K6).

88 aa) In K6, a process for the production of fine cerium oxide powder (CeO_2) with the addition of zirconium is disclosed. Advantageous properties cited are a large BET-specific surface area and good thermal stability, both of which are useful for use as an auxiliary catalyst. As a result of a first embodiment, a powder is described whose specific surface area after four hours of heat treatment at different temperatures has the following values (K6de p. 5 lines 71 ff.):

| | |
|-------|-----------------------|
| 500°C | 122 m ² /g |
| 700°C | 59 m ² /g |
| 800°C | 37 m ² /g |
| 900°C | 18 m ² /g |

89 bb) Thus, feature 3 is not disclosed.

90 The value indicated for a temperature of 800°C is indeed above the claimed lower limit of 30 m²/g. However, it does not refer to a six-hour heat treatment, but only to a four-hour heat treatment. However, it does not refer to a six-hour heat treatment, but only to a four-hour heat treatment. There are no indications that a value of at least 30 m²/g would remain if the treatment were extended by two hours.

91 cc) Contrary to the appeal, K6 did not suggest the production of a mixed oxide with characteristic 3.

92 However, in view of the advantages of a large specific surface area, the skilled person had reason to look for possibilities to exceed the values known from the state of the art. However, K6 does not give any concrete indications as to how this goal can be achieved. In particular, unlike in the patent in suit, no method is disclosed there by which the value claimed with feature 3 can be obtained without further modification.

93 dd) The European patent application 338 567 (K8) does not give rise to any further suggestions.

94 In K8, a preparation of cerium oxide with a large specific surface area is disclosed. As embodiment example 1, a product is disclosed which has a specific surface area of 50 m²/g after calcination at 800°C for six hours (K8 p. 8 line 9). In embodiment example 4, the corresponding value is even 80 m²/g (K8 p. 9 lines 16 f.).

95 These explanations and the numerous publications in which the combination of cerium and zirconium is described as advantageous may have prompted the skilled person to improve the properties of the product disclosed in K8 by adding zirconium. However, this did not provide the skilled person with any concrete indications as to how he could achieve a mixed oxide whose specific surface has similarly favorable values as the cerium oxide disclosed in K8. Evidence that could support the assumption that the specific surface area would not change significantly in the process disclosed in K8 despite the addition of zirconium is neither shown nor otherwise apparent.

96 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.

Meier-Beck

Gröning

Bacher

Hoffmann

Kober-Dehm

Previous instance:

Federal Patent Court, judgment of 27 September 2016 – 3 Ni 4/15 (EP) –