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**Datasheet for the decision
of 26 April 2018**

Case Number: T 1365/15 - 3.3.03

Application Number: 08703822.0

Publication Number: 2112172

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Language of the proceedings: EN

Title of invention:
PARTICULATE WATER-ABSORBENT POLYMER AND PROCESS FOR PRODUCTION
THEREOF

Patent Proprietor:
Nippon Shokubai Co., Ltd.

Opponent:
Evonik Degussa GmbH

Relevant legal provisions:
EPC Art. 123(2), 100(b), 54, 56

Keyword:
Amendments - main request - added subject-matter (no)
Sufficiency of disclosure - main request (yes)
Novelty - main request (yes)
Inventive step - main request (yes)



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Case Number: T 1365/15 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 26 April 2018

Appellant: Evonik Degussa GmbH
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
15 May 2015 concerning maintenance of the
European Patent No. 2112172 in amended form.**

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
C. Brandt

Summary of Facts and Submissions

- I. The appeal lies with the decision of the Opposition Division posted on 15 Mai 2015 concerning the maintenance of European patent No. 2 112 172 in amended form.
- II. A notice of opposition was filed in which revocation of the patent in its entirety was requested on the grounds that its subject matter lacked novelty and inventive step, had no basis in the application as originally filed and was not sufficiently disclosed.
- III. During opposition proceedings, the following documents *inter alia* were cited:
D2: JP-A-08283318
D2a: translation of D2
D3: JP-A-05086251
D3a: translation of D3
D4: JP-A-2000327926
D4a: translation of D4
D5: WO 96/15165
D6: EP 0 781 804 A2
D7: Modern Superabsorbent Polymer Technology, F.L. Buchholz and A.T. Graham (Eds.), Wiley - VCH, 1998, pages 72-74 and 93-103
- IV. As far as relevant to the appeal, the decision of the opposition division can be summarized as follows:
- (a) The ground under Article 100 c) EPC prejudiced the maintenance of the patent on the basis of the main request as well as on the basis of auxiliary requests 1-8. By contrast, auxiliary request 9a and in particular its claim 2 satisfied the requirements of Article 123(2) EPC, since the

description as originally filed provided a basis for the addition of a phosphorous compound both to the monomer as well as to the hydrogel polymer and since it was clear that the maximum amount of 1000 ppm of phosphorous compound applied to all post-process addition processes, i.e. also those in which some phosphorous compound was also added before polymerization.

- (b) The ground under Article 100 b) prejudiced the maintenance of the patent in the form of auxiliary request 9 but not according to auxiliary request 9a. In particular, the choice of a neutralized or unneutralized monomer in the calculation of the amount of phosphorous compound only influenced the limits of the scope of protection that constituted a clarity issue, but did not prevent the skilled person to put the invention into practice.
- (c) Claim 1 of auxiliary request 9a was novel in view of D2a and in particular its examples 11 and 12 because the amount in phosphorous disclosed therein (30 000 ppm) was outside the claimed range of 1-100 ppm and because these examples did not disclose the presence of iron in the monomer aqueous solution. Besides, while the method of example 38 involved 4 ppm of iron, it did not mention the presence of a phosphorous compound as chelating agent. The selection of a phosphorous compound as chelating agent as well as its corresponding amount in order to arrive at the claimed subject matter from example 38 was not explicitly disclosed in D2a.
- (d) Claim 10 of auxiliary request 9a lacked an inventive step in view of the closest prior art D3/

D3a and in particular in view of its example 3. That conclusion also applied to auxiliary requests 10-16.

- (e) The claims of auxiliary request 17 were inventive over D3/D3a. In particular, the problem solved by the claimed subject matter of claim 10 was to provide a water-absorbent polymer with an improved absorption ability, while maintaining resistance to colouring and suitable particle size characteristics. Since D3/D3a focused on resistance to yellowing and was silent about improving absorption, it did not provide a motivation to use 100 to 500 ppm of organic phosphorous compound in the composition in order to solve the problem posed. Claim 10 of auxiliary request 17 was therefore inventive.

- (f) As to claim 1 of auxiliary request 17, it differed from example 3 of D3/D3a in the presence of 0.001-5 ppm iron and in the amount of organic phosphorous compound. A comparison of example 1 and comparative example 1 of the contested patent showed that the polymerization of the monomer aqueous solution did not start when the amount in organic phosphorous compound (about 500 ppm) was outside the claimed range (1-100 ppm). The problem solved over example 3 of D3/D3a was thus to provide resistance to colouring while avoiding a polymerization delay or inhibition. Although D3/D3a, D2 and D4 mentioned amounts in organic phosphorous compound that were according to claim 1, they did not suggest that the amount in phosphorous was the solution to the problem posed. Also, claim 1 of auxiliary request 17 was therefore

inventive.

- V. The opponent (appellant) lodged an appeal against that decision. Calculations concerning the amounts of components used in the examples of the contested patent (Annex 1) and a test report (D8) were annexed to the statement setting out the grounds of appeal.
- VI. In its reply to the statement of grounds of appeal, the patent proprietor (respondent) submitted arguments for the main request (corresponding to auxiliary request 17 in the contested decision) and filed auxiliary requests 1-11.

Claims 1, 2 and 10 of the main request read:

"1. A method for producing a particulate water-absorbent polymer, the method comprising: polymerizing a monomer aqueous solution (B) containing (i) at least one type of monomer (A) that is capable of forming a water-absorbent polymer by polymerization, (ii) at least one type of crosslinking agent, (iii) at least one type of polymerization initiator and (iv) an organic phosphorous compound in an amount of not less than 1 ppm by mass but not more than 100 ppm by mass with respect to the monomer (A) so as to obtain a hydrogel polymer; and thermally drying the hydrogel polymer, wherein the monomer aqueous solution (B) contains iron in an amount of not less than 0.001 ppm by mass but not more than 5 ppm by mass (based on Fe_2O_3) with respect to the monomer (A)."

"2. The method according to claim 1, wherein the organic phosphorous compound is further added to the hydrogel polymer after the polymerization such that the

hydrogel polymer before the drying contains the organic phosphorous compound in an amount of less than 1000 ppm by mass with respect to the water-absorbent polymer particle, and the drying temperature during the step of thermally drying is not less than 150°C but not more than 250°C."

"10. A particulate water-absorbent polymer containing: an organic phosphorous compound in an amount of not less than 30 ppm by mass but not more than 500 ppm by mass with respect to the particulate water-absorbent polymer; and iron in an amount of not less than 0.001 ppm by mass but not more than 5 ppm by mass (based on Fe₂O₃) with respect to the particulate water-absorbent polymer, the particulate water-absorbent polymer satisfying the following (a) to (c):

(a) a particle of the particulate water-absorbent polymer after 7-day exposure to atmosphere of 70±1°C of temperature and 65±1% of relative humidity exhibits an L value (Lightness) of 70 or higher in Hunter's Lab color system;

(b) the particulate water-absorbent polymer contains particles having a diameter of less than 150 µm in an amount of 0 or more mass % but not more than 5 mass %; a mass median particle size (D50) is not less than 200 µm but not more than 600 µm; and a logarithmic standard deviation (σ_{ζ}) of a particle size distribution is not less than 0.20 but not more than 0.40; and

(c) an absorbency against pressure (AAP) under pressure of 1.9 kPa or 4.8 kPa for 0.90 mass % sodium chloride aqueous solution for 60 minutes is

at least 20 (g/g)."

- VII. With letter of 13 December 2016, the respondent filed D9, a declaration of Mr Kunihiro Ishizaki dated 7 December 2016 containing a rework of example 1 and comparative example 1 of the contested patent.
- VIII. In a communication sent in preparation of the oral proceedings, the Board summarised the points to be dealt with and provided a preliminary view on the disputed issues.
- IX. Oral proceedings were held on 26 April 2018.
- X. The arguments provided by the appellant, as far as relevant to the present decision, can be summarised as follows:

Main request

Amendments

- (a) Claim 2, as a result of its amended dependency upon claim 1, pertained to a method in which an organic phosphorous compound was added both to the aqueous monomer solution, before polymerization, and to the hydrogel polymer produced, after polymerization. The description as originally filed only provided a support for a method in which an organic phosphorous compound was added either before or after polymerization of the monomer aqueous solution but not before and after the polymerization. Even a combination of claims 8, 5, 3 with claims 2 or 1 as originally filed did not provide a suitable basis for amended claim 2. The disclosure on page 21 (last paragraph) was

ambiguous since it appeared to contradict the disclosure on page 22 (second paragraph) which only referred to situations in which the organic phosphorous compound was added before or after polymerization. Also, the disclosures concerning the amounts in organic phosphorous compound in the description only applied to methods in which that compound was added before or after the polymerization. There was no teaching regarding the amounts of organic phosphorous compound when it was added both before and after polymerization. Claim 2 was therefore amended in such a way that it contained subject-matter which extended beyond the content of the application as filed.

Sufficiency of disclosure

- (b) Claims 1-9 were not sufficiently disclosed in the patent in suit. Depending on whether the definition of the monomer (A) only referred to the pure monomer or whether it also encompassed its neutralised form, a different amount in monomer (A) formed the basis for the determination of the amount in organic phosphorous compound in the claimed method. Also, Annex 1 showed that it was unclear whether the examples of the patent in suit were according to the claims or not. Consequently, the skilled person did not know how to perform the method as claimed.

- (c) Claim 10 did not specify whether the water content had to be taken into account in the amount of particulate water-absorbent polymer forming the basis for the definition of the amounts in organic phosphorous compound and iron. Since the water content made a significant difference in the

calculated ranges of phosphorous compound and iron, lack of sufficiency was established.

- (d) The test report D8 showed that a rework of example 1 of the contested patent had not been successful since the polymerization did not start. Further examples based on the same method with 75 ppm and 100 ppm of organic phosphorous compound showed that the claimed subject matter was not reproducible over the whole scope of the claims.

Novelty

- (e) D2a disclosed the essential features of claim 1 of the main request. Besides, the use of iron as initiator of radical polymerization in the same amount as that claimed was known from D5.
- (f) Claim 2 also lacked novelty in view of D3a, D4a and D6.

Inventive step

- (g) D3/D3a and in particular its example 3 represented the closest prior art for both claim 1 and claim 10 of the main request. Claim 1 differed from example 3 of D3/D3a in the presence of iron (0.001-5 ppm) which was not disclosed in D3/D3a and in the amount organic phosphorous compound (1-100 ppm) present in the monomer aqueous solution (1000 ppm in example 3).
- (h) Examples 4, 5, 7 and 8 were not according to claim 1 as the polymerizations of these examples were conducted in the presence of more than 100 ppm of organic phosphorous compound. Also, the presence

of iron was not associated with any technical effect in the patent in suit. Further, the test report D8 showed that the presence of phosphorous compound did not result in water-absorbent polymers and therefore no effect could be acknowledged for the claimed method. Besides, a comparison of examples 1 and 4 of the patent in suit showed that the long term stability was in fact improved when more than 100 ppm of organic phosphorous compound was used in the method. It was therefore not established that any effect of the claimed method resulted from the distinguishing features over D3/D3a. The problem solved over D3/D3a was therefore the provision of an alternative method for the preparation of particulate water-absorbent polymer with resistance to colouring. D3/D3a already taught the use of an organic phosphorous compound in an amount of 100 ppm to 100 000 ppm for that purpose. D3/D3a further taught that an excessive amount of phosphorous could lead to a worsening of the water absorbing properties of the polymer thereby leading to a motivation to reduce the amount of phosphorous compound used. Claim 1 therefore lacked an inventive step over D3/D3a.

- (i) Also, claim 1 encompassed a method in which the amount in organic phosphorous compound could be up to 100 ppm. The evidence on file showed that a method could still be carried out with 50 ppm of phosphorous compound (example 1 of the patent in suit) but that it could not be carried out when the amount of phosphorous was 60 ppm.
- (j) Claim 10 did not require the presence of the organic phosphorous compound in the monomer aqueous solution. While it had been shown that the

production of the water-absorbent polymers depended on the application of specific steps during polymerization, claim 10 did not reflect these process steps. As the patent in suit did not show in how far the addition of organic phosphorous compound after polymerization or conditions a)-c) solved a technical problem, claim 10 too lacked an inventive step.

XI. The arguments of the respondent, as far as relevant to the present decision, can be summarised as follows:

Main request

Amendments

(a) Claim 2 was based on a combination of claims 8, 5, 3 and 2 with the passages on page 20 (second paragraph) and on page 22 (second paragraph) of the application as originally filed. The first sentence of the first paragraph on page 22 was not meant to exclude a method in which the organic phosphorous compound was added before and after the polymerization. Claim 2 was therefore not amended in such a way that it contained subject-matter which extended beyond the content of the application as filed.

Sufficiency of disclosure

(b) The objection against claims 1-9 pertained to an objection of lack of clarity rather than of a lack of sufficiency of disclosure. The amount of monomer (A) present in the solution could always be calculated, taking into account a possible

neutralisation of the monomer.

- (c) There was no difficulty for the skilled person to produce a particulate water-absorbent polymer containing 30-500 ppm by mass of organic phosphorous compound as claimed and possibly adding further organic phosphorous compound to the dried mass of the water-absorbent polymer to adjust the concentration to the claimed range.
- (d) The polymerization attempts disclosed in the test report D8 were not reworked as disclosed in example 1 of the contested patent since a higher amount of inhibitor was used, the reactor was not described and the scale of the process was reduced. The failed attempts to perform a polymerization could be attributed to any of these differences. More generally, sufficiency of disclosure could not be established on the basis of an unsuccessful reproduction of one example of the contested patent.

Novelty

- (e) None of documents D2/D2a, D3/D3a and D4/D4a clearly and unambiguously disclosed a production method meeting all technical features recited in claims 1 and 2 of the main request. The main request was novel over these documents.

Inventive step

- (f) Example 3 of D3/D3a was the closest prior art. Claim 1 of the main request differed from the closest prior art in the amount of iron and in the amount of organic phosphorous compound present in

the monomer aqueous solution.

- (g) While the examples of the patent in suit did not directly concern the amount in iron specifically, the presence of iron was not irrelevant to the conduct of the claimed method. On the contrary, the examples of the patent in suit (production example 1, examples 1 and 2 and comparative examples 1 and 2) showed that a specific amount in organic phosphorous compound had to be combined with a specific amount in iron before polymerization to obtain polymers according to the patent in suit.
- (h) The examples of the patent in suit showed, as compared to D3/D3a, that the amount in phosphorous was critical to obtain an improved control of the polymerization while not negatively affecting the polymer long term colour stability. The problem solved over D3/D3a was the provision of a method for the preparation of particulate water-absorbent polymers with resistance to coloration allowing an improved control of the polymerization.
- (i) While D3/D3a taught the addition of 0.01-10 % by mass (100 to 100 000 ppm) of organic phosphorous compound, that document did not teach the addition of iron and the use of less than 100 ppm of organic phosphorous compound before polymerization in order to solve the posed problem. None of D2/D2a, D4/D4a, D5, D6 or D7 taught the solution to the claimed problem, on the contrary, the prior art taught to avoid iron in the monomer solution.
- (j) With regard to claim 10, the difference between the particulate water-absorbent polymer of the invention and the particulate water-absorbent

polymer described in Example 3 of document D3/D3a was that the latter did not include iron in an amount of 0.001 to 5 ppm by mass, nor an organic phosphorous compound in an amount of 30 to 500 ppm by mass, nor fulfilled each of requirements (a), (b) and (c) recited in claim 1. Comparative Example 4 of the patent in suit described a particulate water-absorbent polymer containing 1000 ppm by mass of an organic phosphorous compound that corresponded to the product of example 3 of D3/D3a.

- XII. The appellant requested that the decision under appeal be set aside and that the European patent No. 2 112 172 be revoked. The appellant additionally requested that the respondent's submission concerning the use of a certain amount of iron be not admitted into the proceedings.
- XIII. The respondent requested that the appeal be dismissed and the patent be maintained in amended form as allowed by the opposition division, or, alternatively that the patent be maintained on the basis of any of the auxiliary requests 1 to 11 as filed with the rejoinder to the statement of grounds of appeal.

Reasons for the Decision

Main request

1. Amendment - claim 2
 - 1.1 Claim 2 of the main request, by way of its dependency on claim 1, is directed to a method of production of a particulate water-absorbent polymer by polymerization

of a monomer aqueous solution containing an organic phosphorous compound in an amount of 1 to 100 ppm by mass with respect to the monomer so as to obtain a hydrogel polymer and thermally drying of the hydrogel polymer. Claim 2 also specifies that the organic phosphorous compound is further added to the hydrogel polymer after the polymerization such that the hydrogel polymer before drying contains the organic phosphorous compound in an amount of less than 1000 ppm by mass with respect to the water-absorbent polymer particle.

- 1.2 In that respect, the wording of claim 2 "the organic phosphorous compound is further added [...]" clearly refers to a situation in which it is the same organic phosphorous compound as that present in the monomer aqueous solution that is added once more to the hydrogel polymer post-polymerization but before drying.
- 1.3 The question the Board has to answer on the basis of the objection of the appellant is whether the application as originally filed provides a basis for a method in which the organic phosphorous compound is present in the monomer aqueous solution and is also added once the hydrogel polymer is obtained.
- 1.4 For this purpose, the section of the application as originally filed dealing with the organic phosphorous compound was cited by the parties and in particular the passage starting on page 20, first full paragraph, to page 22, second full paragraph. This passage relates to the ways in which the organic phosphorous compound is involved in the method and essentially defines its addition by reference to the polymerization of the aqueous monomer solution resulting in a hydrogel polymer as claimed.

- 1.5 The passage on page 20 (second paragraph) relates to the presence of organic phosphorous compound in the monomer aqueous solution prior to the polymerization and in accordance thereto defines the preferred amount of phosphorous compound in that solution as being 1 to 100 ppm. Furthermore, the next passage on page 21 (last five lines) which reads "the organic phosphorous compound is further added after the monomer (A) containing the predetermined amount of organic phosphorous compound is polymerized", describes a situation in which the same organic phosphorous compound as that present in the monomer aqueous solution is added in another step of the method, post-polymerization. That passage therefore clearly sets out that the organic phosphorous compound can be added before and after polymerization. The first full paragraph on page 22, further specifies when the organic phosphorous compound may be added after polymerisation, namely "to a hydrogel polymer, to a dried polymer after a drying process, or may be added in a surface-crosslinking process".
- 1.6 In that context, the sentence at the beginning of the first paragraph of page 22 reading "The organic phosphorous compound may either be added to the monomer (A) before or after the polymerization" cannot be read as to refer to the addition of organic phosphorous compound either before or after polymerization exclusively. Rather, in the context of the method disclosed in the foregoing paragraph, the use of the conjunction "or" in the sentence can only be understood to be inclusive and also refers to the method wherein an organic phosphorous compound is added both prior to as well as after polymerization. In that respect, the reference to a "total" amount of the organic phosphorous compound in the water-absorbent polymer

particle in the following second full paragraph on page 22 is congruent with a situation where the organic phosphorous compound has been added before as well as after polymerization. That passage also defines that amount of organic phosphorous compound as being less than 1000 ppm by mass, in accordance with the wording of claim 2 of the main request.

1.7 The description on pages 20 to 22 of the application as originally filed therefore provides a basis for a method in which an organic phosphorous compound is present in an amount of 1 to 100 ppm in the monomer aqueous solution prior to polymerization and wherein that compound is further added to the hydrogel polymer so as to result in a total amount of less than 1000 ppm by mass with respect to the water-absorbent polymer particle.

1.8 The Board concludes that the disputed combination of the presence of an organic phosphorous compound in the monomer solution and its addition after polymerisation according to claim 2 of the main request finds a basis in claim 2 as originally filed read in the context of the passages on page 20 to 22 of the description.

2. Sufficiency of disclosure

2.1 Definition of monomer (A)

2.1.1 With regard to the definition of the monomer (A) in the method of independent claim 1, the opposition division considered that the issues raised on the basis of the calculations provided in Annex 1 in fact related to a lack of clarity and not to a lack of sufficiency of disclosure. In that respect, it was not disputed by the parties in appeal that the calculations provided in

Annex 1 showed that the calculated amount of organic phosphorous compound depended on the definition adopted for the monomer (A), namely whether it referred to the pure form of the monomer only, such as acrylic acid, or whether it referred to the monomer after neutralisation, in that case the acrylate.

2.1.2 The question the Board has to answer in that context is whether the alleged ambiguity in the definition of the monomer (A) which may result in a lack of accuracy of the determination of the amount in organic phosphorous compound in the monomer aqueous solution is such that it also results in a lack of sufficiency of disclosure of the claimed subject matter.

2.1.3 The question to be answered for sufficiency is not whether one can establish with a high degree of accuracy all the parameters of the method, but rather if the skilled person is able to perform the method as claimed. In that regard, while the appellant has established on the basis of Annex 1 the existence of a possible ambiguity due to a lacking definition of the monomer (A) used to calculate the amount in organic phosphorous compound in the monomer aqueous solution, he has not shown how that lack of accuracy would prevent the skilled person from performing the claimed method. As long as the claimed method can be carried out, a lack of accuracy of a claimed parameter in a method does not lead to a lack of sufficiency of disclosure of the claimed subject matter. As a consequence, the ambiguity regarding the definition of monomer (A) in claim 1 cannot be regarded as establishing an insufficient disclosure.

2.2 Definition of the water-absorbent polymer

2.2.1 The objection of lack of sufficiency of disclosure raised against independent claim 10 was based on the possibly ambiguous definition of the water-absorbent polymer. In particular, claim 10 does not specify whether the water content remaining in the water-absorbent polymer has to be taken into account for the determination of the amount in organic phosphorous compound in the polymer. Annex 1 showed that in some instances (examples 4, 7 and 8 according to the contested patent) the calculated amount in organic phosphorous compound depended on the water content in the water-absorbent polymer. That objection was essentially based on the same reasoning as that laid out in point 2.1 above, namely that an ambiguity in the definition of the claimed subject matter resulted in a lack of accuracy when determining the amount of organic phosphorous compound added to the polymer. With respect to that objection again, the appellant argued that the lack of accuracy of the amount in organic phosphorous compound constituted a lack of sufficiency of disclosure. It was however not argued, nor shown that that lack of accuracy prevented the preparation of a particulate water-absorbent polymer. As a consequence in that case also, the ambiguity regarding the definition of the water-absorbent polymer in claim 10 cannot be regarded as establishing an insufficient disclosure.

2.3 Test report D8

2.3.1 The test report D8 provided with the statement setting out the grounds of appeal is based on example 1 of the contested patent. It contains the protocol followed for the repetition of example 1 as disclosed in the contested patent, i.e. the polymerization of a monomer aqueous solutions containing an organic phosphorous

compound in an amount of 50 ppm as well as tests carried out with varying amounts of organic phosphorous compound (0 ppm, 75 ppm and 100 ppm). On the basis of a measurement of the temperature over 10 minutes in the polymerization reactor, it is established whether the polymerization had started or not. D8 concludes that for all the tests involving the presence of the organic phosphorous compound a polymerization did not start. In that respect, the conclusion of the appellant in view of lack of sufficiency against claims 1 and 10 of the main request was that the contested patent did not provide the necessary guidance to arrive at the claimed subject matter without undue burden.

- 2.3.2 However, neither the statement setting out the grounds of appeal, nor the argumentation submitted at the oral proceedings before the Board addressed the critical guidance that was allegedly missing from the contested patent.
- 2.3.3 On the other side, the respondent made it credible that a higher amount of inhibitor in D8 (60 ppm instead of 50 ppm in example 1) might be the cause for the failed polymerization and provided a repetition of the polymerization that was more faithful to that of example 1 and showed that a polymerization did start under these conditions. Since the control of the amount in inhibitor in a polymerization reaction is part of the common general knowledge, the fact that neither claim 1 nor claim 10 limited the amount in inhibitor during polymerization is not relevant to the question of sufficiency of disclosure.
- 2.3.4 Under these circumstances, the argument based on alleged cumbersome and numerous experiments needed to reproduce the claimed subject matter cannot prevail

since it was not shown that the reproducibility of the claimed subject matter involved an undue burden.

2.3.5 Therefore, the evidence provided with D8 falls short of establishing a lack of sufficiency of disclosure of claims 1 and 10.

3. Novelty

3.1 D2a

3.1.1 With respect to D2a, the decision of the opposition division concluded that example 38 of that document did not anticipate claim 1 since two selections relating to the specific chelate and its amount in the monomer aqueous solution within the broad disclosure of D2a were necessary in order to arrive at the claimed subject matter (point 9.2 on page 11 of the contested decision).

3.1.2 The objection of lack of novelty of claim 1 in view of D2a that was made in appeal was solely based on the arguments provided in writing with the statement setting out the grounds of appeal (page 10). That objection was based on the disclosure of example 38 of D2a (paragraph 102) which was readily combined with a passage in paragraph 22 mentioning olefinically unsaturated phosphoric acids as the chelating agent. Both paragraphs were cited in a table without any additional arguments.

3.1.3 By means of this, the appellant did not explain why the disclosure of example 38 in D2a could be combined with the general passage mentioning the phosphorous compound as chelating agent. In addition, the selection of the amount of phosphorous compound was not addressed at all

by the arguments submitted by the appellant. Thus, the appellant did not indicate in appeal in which respect the decision of the opposition division regarding novelty over example 38 of D2a was incorrect since the reasoning of the opposition division explicitly based on the lack of disclosure of phosphorous compound and its amount in example 38 was not addressed.

3.1.4 Under these circumstances, the Board considers that the novelty objection over D2a as submitted by the appellant in appeal was not substantiated and sees no reasons to overturn the decision of the opposition division in that respect.

3.2 D3a, D4a and D6

3.2.1 With respect to D3a, D4a and D6, the arguments provided with the statement of grounds of appeal (pages 11 and 12) pertained to a lack of novelty of claim 2 only. The decision of the opposition division however contains no reference to novelty objections based on those documents. These objections are therefore new to the appeal proceedings.

3.2.2 Claim 2 of the main request is dependent on claim 1 and is therefore also defined by its features, among which the amount in organic phosphorous compound (1-100 ppm) and the amount in iron (0.001 to 5 ppm) in the monomer aqueous solution. These features of claim 2 are however nowhere addressed with respect to D3a, D4a and D6 in the statement setting out the grounds of appeal (pages 11 and 12) and the Board does not find a disclosure of a combination of these features in these documents. For this reason, the novelty objection against claim 2 in view of D3a, D4a and D6 fails.

- 3.3 In view of the above points 3.1 and 3.2, the Board conclude that the decision of the opposition division in view of novelty of the main request is maintained.
4. Inventive step
- 4.1 The aim of the patent in suit was to provide a particulate water-absorbent polymer having an excellent urine tolerance and long-term color stability, and a method for producing the particulate water-absorbent polymer (paragraph 1).
- 4.2 The object of D3/D3a relates to water-absorbent polymer compositions that can be employed as paper diapers and sanitary towels which are not prone to coloration over time even when they are stored at high temperature and high humidity (paragraphs 1 and 2). D3/D3a therefore deals with the same applications as those of the contested patent and aims at solving a similar problem. Document D3/D3a was considered as the closest prior art in the decision under appeal and has been used as such by both parties in their arguments. In that respect, example 3 of D3/D3a was found to be particularly relevant. The Board sees no reason to choose a different approach.
- 4.3 Example 3 of D3/D3a concerns the production of a water-absorbent polymer by polymerizing an aqueous solution of acrylic acid as monomer, 2,2'-azobis(N,N'-methyleneisobutylimidine) hydrochloride as crosslinking agent, N,N'-methylenebisacrylamide as initiator and 0.1 wt% (1000 ppm) of 1-hydroxyethylidene-1,1-diphosphonic acid as an organic phosphorous compound and drying the resulting hydrogel polymer (paragraphs 23 and 24). There is no disclosure in D3/D3a of the presence of iron in the monomer aqueous

solution and the L value (Lightness), the diameter of the particles and the value of the absorbency against pressure (AAP) of the particulate water-absorbent polymer produced are not disclosed.

4.4 Claim 1

4.4.1 With respect to the method for producing the particulate water-absorbent polymer of claim 1 of the main request, the parties agreed that the distinguishing features were the amount in iron contained in the monomer aqueous solution and the amount in organic phosphorous compound by mass with respect to the monomer (A).

4.4.2 The technical problem solved over the closest prior art was established in the contested decision (point 15.7) as to provide resistance to colouring while avoiding a polymerization delay or inhibition. As the presence of an effect is contested by the appellant, it needs to be analysed whether such a formulation is correct.

4.4.3 While the respondent had acknowledged in his rejoinder to the statement of grounds of appeal that "the patent in suit did not include any experimental data clearly and unambiguously showing the use of an aqueous monomer solution obligatorily containing iron in an amount of 0.001 to 5 ppm by mass to be especially advantageous [...]" (page 8, last paragraph), it was argued for the first time at the oral proceedings before the Board based on the examples of the patent in suit (production example 1, examples 1 and 2 and comparative examples 1 and 2) that a combination of specific amounts of organic phosphorous compound and iron in the monomer aqueous solution was critical to the particulate water absorbent polymers. That argument however was based on

a content of iron in the monomer solution of comparative example 2 that was alleged to be 0.34 ppm, but which is nowhere disclosed as such in the patent in suit and for which the respondent could not provide a basis at the oral proceedings. Under these circumstances, the Board concludes that that argument of the respondent cannot establish the presence of an effect due to the amount in iron in the monomer aqueous solution, since the purported effect was not shown to be causally linked to the amount in iron. The amount of iron involved in the method was therefore disregarded for the formulation of the technical problem in accordance to the case law of the boards of appeal, establishing that features which do not contribute to the solution of the problem set in the description are not to be considered in assessing the inventive step of a combination of features (Case Law of the Boards of Appeal, 8th Edition, I.D.9.5).

4.4.4 Thus, the question that had to be answered was whether the use of 1 to 100 ppm of organic phosphorous compound by mass with respect to the monomer (A) provided resistance to colouring while avoiding a polymerization delay or inhibition, as formulated in the contested decision. In that respect, examples 1-8 and comparative example 1 of the patent in suit, as well as the test report D8, were cited by the parties.

4.4.5 Example 1 of the patent in suit discloses the polymerization of a monomer aqueous solution containing (i) a sodium acrylate aqueous solution as monomer (A), (ii) a crosslinking agent, (iii) a polymerization initiator and (iv) ethylenediaminetetra (methylene phosphonic acid) as organic phosphorous compound in an amount of 50 ppm by mass. The temperature of the monomer solution is maintained at 35°C and after

14 minutes from polymerization initiation, a polymerization temperature reached its peak temperature of 96°C. After 44 minutes of polymerization, a hydrogel polymer is recovered before being hot-air dried at 180°C for 45 minutes.

4.4.6 A further polymerization was performed according to the preparation of example 1 but with 100 ppm of ethylenediaminetetra (methylene phosphonic acid) as organic phosphorous compound (example 2). In that respect, the method of examples 1 and 2 correspond to the method of claim 1 of the main request wherein 1 to 100 ppm of organic phosphorous compound is used.

4.4.7 The polymerization of comparative example 1 was cited by the respondent as evidence that an effect had been achieved by the claimed subject matter over example 3 of D3/D3a wherein 0.1 wt% (i.e. 1000 ppm) of organic phosphorous compound was used (paragraph 24). In that regard, the question is whether that comparative example can be seen as representative of example 3 of the closest prior art.

4.4.8 The protocol followed in comparative example 1 of the patent was analogous to that of examples 1 and 2 in which ethylenediaminetetra (methylene phosphonic acid) was present as organic phosphorous compound, except that 500 ppm of that compound was used in the monomer aqueous solution of comparative example 1 instead of 50 ppm (example 1) or 100 ppm (example 2). Although the polymerization of comparative example 1 was carried out in the presence of a lower amount of organic phosphorous compound than in example 3 of D3/D3a (500 ppm instead of 1000 ppm), comparative example 1 of the patent can nevertheless be seen as representative of example 3 of D3/D3a since it generally shows the

effect of adding an organic phosphorous compound in the monomer aqueous solution in an amount that is well in excess of the claimed range of 1 to 100 ppm.

4.4.9 The polymerizations according to example 1 and comparative example 1 and the coloring evaluation with respect to the polymer of example 1 as shown in Table 1 establish that an amount of organic phosphorous compound as claimed (1-100 ppm) results in a water-absorbent polymer having resistance to colouring while an amount of organic phosphorous compound above the claimed range inhibits the polymerization. That is also in line with the teaching provided in paragraph 38 or the patent in suit.

4.4.10 It was not disputed that examples 4, 5, 7 and 8 of the contested patent did not represent the subject matter of claim 1 since the amount of organic phosphorous compound present in the monomer aqueous solution before polymerization was outside the claimed range in these examples, as shown in Annex 1. This can however not establish that the distinguishing feature of claim 1 over the closest prior art D3/D3a has no technical effect at all since the comparison of example 1 and comparative example 1 showed the contrary. Also, as the amount of organic phosphorous compound present in the monomer aqueous solution before polymerization of examples 4, 5, 7 and 8 is well below that used in comparative example 1 and in example 3 of D3/D3a, these examples cannot provide an insight on the closest prior art and so do not change the fact that an effect must be acknowledged from claim 1 over D3/D3a. These examples, which were not according to claim 1, were however not relevant for the formulation of the technical problem solved by the subject matter of

claim 1 over the closest prior art.

4.4.11 D8 is a test report describing the preparation of four monomer aqueous solutions differing from one another in their amount of organic phosphorous compound (0 ppm, 50 ppm, 75 ppm and 100 ppm). D8 shows that the polymerization of these monomer solutions failed to start when the organic phosphorous compound was present in the monomer solution in an amount of 50 ppm, 75 ppm and 100 ppm. The result of these polymerizations however stood in contrast with the examples 1 and 2 of the contested patent, as well as with the rework of example 1 enclosed in D9, which showed that a polymerization had been successfully carried out when the amount of organic phosphorous compound in the monomer aqueous solutions was 50 ppm and 100 ppm. In that regard, it was made credible that the amount in inhibitor that was used in the polymerizations of D8 was 20% higher (60 ppm) than in the polymerization according to examples 1 and 2 and D9 (50 ppm) and that this alone could account for the failed polymerizations described in D8, all the more so as the presence of an organic phosphorous compound has an inhibiting effect on the polymerization as well (paragraph 38 of the patent in suit). Under these circumstances, D8 is found to be not sufficient to put into question the formulation of the technical problem solved by the claimed subject matter of the main request based on the examples in the patent.

4.4.12 In view of the comparison of example 1 and comparative example 1, the Board finds that the problem solved over the closest prior art as formulated in the contested decision (i.e. to provide resistance to colouring while avoiding a polymerization delay or inhibition) can be

considered to be solved by the method of claim 1.

- 4.4.13 The question remaining is whether the skilled person starting from D3/D3a would have used between 1 ppm and 100 ppm of organic phosphorous compound in the monomer aqueous solution in order to solve the problem posed.
- 4.4.14 D3/D3a teaches the addition of organic phosphoric acid compounds to water-absorbent polymers, either in the process for producing the polymer, or after polymerization (paragraph 12) in order to improve the color stability of these water-absorbent polymers when stored at high temperature and high humidity (paragraphs 4 and 5).
- 4.4.15 As to the amount of organic phosphoric acid compound added, D3/D3a teaches that "the quantity thereof that is added is 0.01-10 wt% relative to the water-absorbent polymers, and is more preferably 0.05-5 wt%. With less than 0.01 wt%, the effect in preventing coloration over time is weak, and if it exceeds 10 wt% water-absorbing capacity will be lowered" (paragraph 12). In that respect, D3/D3a does not teach that much lower amounts of organic phosphorous compounds in the monomer aqueous solution than the amount used in example 3 is paramount to the course of the polymerization. D3/D3a does therefore not hint at the use of 1-100 ppm of organic phosphorous compound in the monomer aqueous solution.
- 4.4.16 Claim 1 of the main request is therefore inventive in view of D3/D3a.

4.5 Claim 10

- 4.5.1 With respect to the particulate water-absorbent polymer of claim 10 of the main request, the parties agreed

that example 3 of D3/D3a, which remained the closest prior art for that claim, did not disclose any amount in iron contained in the polymer, nor an amount of organic phosphorous compound within the range in claim 10 and did not provide values of the properties of the particulate water-absorbent polymer specified in claim 10, namely the L value (Lightness), the diameter of the particles of water-absorbent polymer and the value of the absorbency against pressure (AAP).

4.5.2 In its contested decision (point 15.3, page 15), the opposition division acknowledged the presence of an effect concerning the absorption under pressure on the basis of a comparison of example 8, representing the subject matter of claim 10 and comparative example 4, representing the closest prior art D3/D3a. The problem was formulated as the provision of a water absorbent polymer with an improved absorption ability, while maintaining resistance to colouring and suitable particle size characteristics. Even if D3/D3a disclosed an amount of organic phosphorous compound as low as 100 ppm, since it was silent about improving absorption and focused on resistance to yellowing, it did not provide a motivation for the skilled person to resort to the amounts of organic phosphorous compound according to claim 10 in order to solve the problem posed.

4.5.3 With regard to that reasoning, the arguments of the appellant were only that the scope of claim 10 was not limited by features describing the preparation of the claimed water-absorbent polymers, in particular the addition of the organic phosphorous compound to the monomer aqueous solution, and that, since the patent in suit did not teach how the parameters (a) to (c) defined in claim 10 could be achieved, any alleged

effect was accidental. Nothing more was put into question.

4.5.4 The arguments provided by the appellant with regard to claim 10 in appeal do not put into question any part of the reasoning about the inventive step of claim 10 of the decision of the opposition division. The fact that product-by-process features do not appear in the product claim is in this respect of no relevance, as the analysis of the product claim was correctly not based on any feature of the process. As to the question of how the parameters (a) to (c) defined in claim 10 could be achieved, it pertains, if at all, to the sufficiency of disclosure of that claim, but does not change the reasoning, nor the conclusion reached on inventive step in the contested decision.

4.5.5 Under these circumstances, the Board does not see, on the basis of the arguments of the appellant, a reason to amend or reverse the decision of the opposition division that claim 10 is inventive in view of the closest prior art D3/D3a.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



L. Stridde

D. Semino

Decision electronically authenticated