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**Datasheet for the decision
of 2 October 2025**

Case Number: T 1020/23 - 3.3.06

Application Number: 16811871.9

Publication Number: 3260485

IPC: B01J20/26, B01J20/28,
C08J3/075, C08J3/12, C08J3/24,
C08J9/08, C08F2/44, C08F220/10

Language of the proceedings: EN

Title of invention:
SUPERABSORBENT POLYMER

Patent Proprietor:
LG Chem, Ltd.

Opponent:
Nippon Shokubai Co., Ltd.

Headword:
Superabsorbent/LG Chem.

Relevant legal provisions:
EPC Art. 83, 56

Keyword:
Sufficiency of disclosure - (yes)
Inventive step - main request (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

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Case Number: T 1020/23 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 2 October 2025

Appellant:
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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 3 April 2023
revoking European patent No. 3260485 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

- I. An appeal was filed by the patent proprietor against the decision of the opposition division to revoke European patent No. 3 260 485 for non-compliance with the requirements of Article 56 EPC (main request) and 123(3) EPC (auxiliary requests 1 and 2).
- II. In the statement of grounds of appeal, the appellant contested the decision and requested that the patent be maintained on the basis of the main request filed with a submission dated 9 January 2023. Further it requested that a translation error in example 1 of the patent be corrected.
- III. The subject-matter of claims 1 and 3 according to the main request read as follows:

"1. A super absorbent polymer, obtainable by the method of claim 3, comprising:

porous particles in which a plurality of pores having an average pore diameter of 10 μm or more are formed on the surface;

secondary granule particles in which primary particles having an average particle diameter of 10 μm to 100 μm are aggregated; and

non-porous particles in which 0 to 3 pores having an average pore diameter of 5 μm or more are present on the surface, wherein the non-porous particles are contained in an amount of 15% by weight to 75% by weight based on the total weight of the super absorbent polymer, and the vortex time is 20 seconds to 70 seconds.

wherein the porous particles are contained in an amount of 20% by weight to 60% by weight,

wherein the secondary granule particles are contained in an amount of 10% by weight to 40% by weight, wherein the average pore diameter is measured by scanning electron microscope, the average particle diameter is measured according to EDANA WSP 220.2, and the vortex time is measured as disclosed in the specification."

"3. A method for preparing a super absorbent polymer according to claim 1 comprising the steps of:

carrying out a crosslinking polymerization of a monomer mixture comprising a water-soluble ethylenically unsaturated monomer having at least partially neutralized acidic groups, a foaming agent, a foam-promoting agent and a silicone-based surfactant in the presence of an internal crosslinking agent to form a hydrogel polymer; drying, pulverizing and classifying the hydrogel polymer to form a base polymer powder; and further crosslinking the surface of the base polymer powder in the presence of a surface crosslinking agent to form a surface crosslinked layer.

wherein the foaming agent includes at least one selected from the group consisting of magnesium carbonate, calcium carbonate, sodium bicarbonate, sodium carbonate, potassium bicarbonate and potassium carbonate,

wherein the silicon-based surfactant is polysiloxane containing polyether side chains, wherein the foam-promoting agent is aluminum salts of inorganic acids and/or aluminum salts of organic acids, wherein the foaming agent is present in an amount ranging from 0.05% to 5.0% by weight based on the total weight of the monomer mixture, the foam-promoting agent is present in an amount ranging from 0.01% to 3% by weight based on the total weight of the monomer mixture, and the silicon based surfactant is present in an amount

ranging from 0.001% to 1% by weight based on the total weight of the monomer mixture."

- IV. In its reply, the opponent and respondent requested that the appeal be dismissed. It also pointed out an additional translation error in example 5 of the patent.
- V. On 26 November 2024, the appellant filed further arguments and agreed with the corrected translation of example 5 of the patent as proposed by the opponent. It also filed an *affidavit* confirming that the data presented in the test report D15 were correct.
- VI. In its preliminary opinion, the board indicated that the invention appeared to meet the requirements of Article 83 EPC and left open the conclusion with respect to the question of inventive step.
- VII. In a submission dated 1 September 2025, the respondent filed additional arguments and referred to documents D3 and US 2023/0149897 A1.
- VIII. At the oral proceedings, held on 2 October 2025, the parties confirmed that the decision should be based on the following requests:

The appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the claims of the main request dated 9 January 2023.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Main request - Sufficiency of disclosure

The board has concluded that the invention as defined in claim 1 is sufficiently disclosed for the following reasons:

- 1.1 The opponent argued, based on the experimental data and paragraph [0066] of the patent, that a superabsorbent as claimed could only be reproduced using the three substances specified in process claim 3. By stating that the superabsorbent of claim 1 was "obtainable by the method of claim 3" rather than "obtained", the use of these substances was to be treated as optional, thus broadening the claim to cover embodiments produced by other methods. Since the proprietor had not provided evidence that the superabsorbent of claim 1 could be obtained by any other method, the invention could not be reproduced over its entire scope, and thus failed to meet the requirement of sufficiency of disclosure.
- 1.2 The board disagrees because, as implicitly acknowledged by the respondent, the patent discloses how to carry out the invention defined in claim 1 at issue, namely by way of the method defined in claim 3. Already for this reason, the requirements of Article 83 EPC are satisfied.

Moreover, even if the arguments of the respondent were to be accepted, and the process of claim 3 regarded as an essential feature for reproducing the invention defined in claim 1, the requirements of Article 83 EPC would nevertheless be fulfilled, as claim 1 defines that the product is "obtainable by the method of claim 3". As indicated in the preliminary opinion, there is

no substantive distinction between a claim defining a product as "obtainable by process A" and one defining it as "obtained by process A", as in both cases the feature is to be construed as a product-by-process limitation, i.e. the claimed subject-matter is limited by those product features which necessarily result from carrying out the specified process. This interpretation applies equally to both formulations, as each indicates that the claimed product, on the basis of its physical properties, could have been produced by the defined process. For example, if the addition of a silicon-based surfactant necessarily imparts a particular physical or chemical property to the superabsorbent, then claim 1 would be restricted to products exhibiting that property, irrespective of whether they were prepared by the process of claim 3 or by some other method. Products lacking that property fall outside the scope of the claim, as they could not have been obtained by the defined process. Conversely, if the addition of the surfactant does not necessarily give rise to any identifiable property of the product, then the corresponding process feature would not impose any limitation on claim 1. This conclusion holds irrespective of whether the claimed product wording is "obtainable by" or "obtained by", the sole decisive consideration being whether the process features necessarily result in recognisable characteristics of the product.

- 1.3 The respondent further argued that, since the parameter "vortex time" was strongly dependent on the temperature of the swelling liquid, the omission of the temperature at which the vortex time was measured would prevent the skilled person from solving the underlying technical problem. For this reason also, the invention was allegedly insufficiently disclosed.

1.4 The board is not persuaded by this argument either, since any uncertainty concerning the conditions under which a parameter is measured affects the clarity of the claims and thus the scope of protection under Article 84 EPC, rather than the reproducibility of the invention under Article 83 EPC. In other words, omitting the measuring temperature raises a demarcation issue, as the vortex time range defined in claim 1 could be measured at different temperatures, leading to a broader and more diffuse scope. However, this does not prevent the skilled person from reproducing the invention, as it would simply require deciding which temperature to use and establishing the vortex time accordingly. The skilled person would thus be able to reproduce the invention by selecting a reasonable or commonly used temperature, such as room temperature, to determine the vortex time.

1.5 The board therefore concludes that the invention is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The requirements of Article 83 EPC are consequently fulfilled.

2. Main request - Inventive step

2.1 Closest prior art

2.1.1 Document D8 (see Example 18) discloses a superabsorbent polymer produced using a method that involves the addition of sodium bicarbonate as a foaming agent, along with certain surfactants (not silicon-based). The resulting polymer achieves a vortex time of 35 seconds, a GBP of 59 Darcy (permeability), and an absorbency under load of 19 g/g.

- 2.1.2 While during the written proceedings, the validity of this disclosure as starting point was contested by the appellant, at the oral proceedings all parties relied on Example 18 of document D8 as the closest prior art. The inventive step argumentation will therefore be formulated using this example as the starting point.
- 2.1.3 The subject-matter of claim 1 at issue differs from this disclosure at least in the particle distribution defined by the ranges of porous, non-porous and secondary granule particles of the superabsorbent (referred to by the respondent as features 1.2, 1.2.2, 1.3, 1.3.2, 1.4 and 1.4.1).
- 2.2 Problem solved by the invention
 - 2.2.1 The patent includes several specific embodiments (see Examples 1 to 5) of a superabsorbent according to the invention, as well as Comparative Example 1. In this latter, the superabsorbent is prepared in the same manner as in Example 5, except that no aluminium salt foam-promoting agent or silicon-based surfactant was added. According to the patent (see Table 1), these differences result in an amount of only 11% of porous particles within the meaning of claim 1, i.e. below the minimum value of 20% defined therein. Although the superabsorbent described in Comparative Example 1 exhibits similar centrifuge retention capacity (CRC), absorbency under load (AUL), and gel bed permeability (GBP), its vortex time and rewetting amount are both significantly inferior to those of the superabsorbent according to the invention.
 - 2.2.2 The proprietor submitted test report D15 including two additional comparative tests. In Additional Comparative Example 2, the polymer was prepared in accordance with

the method of Example 5 of the patent, except that no aluminium salt foam-promoting agent was used. The resulting superabsorbent comprises 18% porous particles, which is higher than in Comparative Example 1 but still below the minimum value of 20% specified in claim 1. Similar to Comparative Example 1, this superabsorbent exhibits absorbency properties comparable to those of the invention, however its vortex time and rewetting values are significantly inferior.

In Additional Comparative Example 3, the polymer is again prepared using the method of Example 5, but without silicon-based surfactant. This superabsorbent falls within the defined ranges for porous and secondary granulate particles, but contains only 12% non-porous particles, i.e. below the minimum of 15% required by claim 1. While this product exhibits satisfactory absorbency properties, its vortex time and rewetting values are again inferior to those of the superabsorbent according to the invention.

2.2.3 The appellant argued that additional comparative example 2 was very similar to example 18 of D8, as both methods used a foaming agent and a surfactant, and the AUL and GBP values were nearly identical. The key difference was that additional comparative example 2 did not use the aluminum sulfate foam-promoting agent, which resulted in a lower proportion of porous particles and a higher vortex time, leading to worse results in the rewetting amount.

2.2.4 The respondent argued that the evidence on file was insufficient to prove that the proposed solution would achieve a technical effect with respect to the closest prior art:

Firstly, none of the comparative examples was representative of the superabsorbent disclosed in Example 18 of document D8. Accordingly, there was no evidence on file demonstrating that the distinguishing features of the claimed invention produced any technical effect with respect to the closest prior art.

Furthermore, Additional Comparative Example 2 in document D15 was clearly not representative of this prior-art superabsorbent, as its vortex time was significantly higher (72 seconds compared with 35 seconds). Moreover, it was unclear how Comparative Example 3 in D15, which contained the highest proportion of porous particles, could exhibit a vortex time markedly higher than those obtained for superabsorbents containing lower proportions of porous particles, since vortex time is generally known to decrease with increasing porosity. As the known superabsorbent already displayed absorbency properties comparable to those of the patent, the particle distribution defined in claim 1 appeared to represent an arbitrary selection.

There was furthermore no basis for concluding that the alleged invention would achieve a good balance between absorbency and retention properties, because claim 1 itself defined a very broad range of vortex times which covered values up to 70 seconds, a result which was significantly worse than the 35 seconds achieved in Example 18 of D8. The other absorption and retention parameters were not even defined in the claim, so the invention effectively covered any possible outcome in that respect.

Additionally, the evidence on file did not show that the observed results were caused by the macroscopic

particle distribution rather than by other factors. In this respect, the respondent noted that the amount of water soluble components in the exemplary embodiments was significantly lower than in the comparative examples. As indicated in D3 (see page 3, lines 9 to 16) and the patent publication US 2023/0149897 A1 (see par. [0007]), higher amounts of "extractables" (equivalent to water soluble components) were associated with poor rewetting results, because they were indicative of lower degree of crosslinking of the superabsorbent polymer. There was therefore no way of concluding whether the observed results were caused by the macroscopic particle distribution, the microscopic polymer structure or both.

Consequently, no technical effect could be associated with the proposed solution, so the objective technical problem solved by the patent had to be reformulated to the provision of an alternative superabsorbent.

2.2.5 The board disagrees because, when assessing the technical effect of the alleged invention, one must carefully weigh the evidence and arguments submitted by both parties, in line with the established principles of free evaluation of evidence and the distribution of the burden of proof in opposition-appeal proceedings.

On the one hand, the proprietor has submitted a series of experimental results, all of which consistently indicate that the defined particle distribution leads to a balanced combination of absorbency and retention properties in the claimed superabsorbent polymer. Where the amount of porous particles falls short of the minimum defined value (see Comparative Examples 1 and 2), the vortex time and the rewetting results are significantly worse. Notably, where the amount of non-

porous particles is below the minimum requirement defined in claim 1 at issue, the results in terms of vortex time and rewetting amount are also poor. The submitted experiments thus form a coherent body of evidence, indicating that maintaining a certain balance in the relative amounts of the different types of particles (porous, non-porous and granules) of the superabsorbent obtained from the methods described therein, leads to well-balanced absorbency and retaining properties.

The respondent has not filed any counter-evidence that would call into question the effects of the claimed particle distribution, but has instead presented arguments aimed at raising doubts as to whether the observed effects could be attributed solely or at all to the differentiating feature(s). Even though the board acknowledges that these arguments are legitimate and based on plausible considerations, they are not considered to be sufficient to outweigh the experimental results provided by the appellant.

More specifically, while the board does not deny - in view of both the references cited by the respondent and the results of the experiments - that the water soluble content of the polymer might play a role in the rewetting results, this does not imply that the claimed particle distribution does not contribute as such to the observed effects. In this respect, Example 1 leads to less rewetting than Examples 2 or 3 despite having higher water soluble content, and in Comparative Example 3 the rewetting is 25% worse than in Comparative Example 2, despite having the same water soluble content.

The respondent's arguments may, at best, suggest that the particle distribution defined in the claim does not provide a complete explanation for the observed effect and that additional factors may also influence the result. However, there is no requirement that the distinguishing features be the sole contributors to the alleged technical effect. A technical effect may still be acknowledged if, on the basis of the available evidence, it is plausible that the differentiating features contribute to achieving it.

The board also notes that the definition in claim 1 of a vortex time of 20 to 70 seconds does not contradict the alleged effect of providing a superabsorbent with balanced absorption and retention properties. It is first noted that vortex time measures the absorption rate, rather than the absorption or the retention capacity as such, so even if the superabsorbent were deemed to have a relatively high vortex time, it could still exhibit balanced absorption and retention properties. In any case, the fact that the upper limit of this range corresponds to a performance inferior to that of the closest prior art does not preclude the range from being considered representative of a balanced outcome in this respect. It can also not be accepted that the absence of specific results for the other absorption and retention parameters in the claim would argue against the achievement of balanced absorption and retention properties. The very purpose of this discussion is to determine whether the features defined in the claim bring about such a balance, and the reason why this assessment is carried out under the requirement of inventive step – rather than sufficiency of disclosure – is precisely to reach a conclusion in a situation where the claim does not explicitly define the results to be achieved for those parameters.

The board therefore concludes, in due consideration of the whole body of evidence and arguments presented by both parties, that the superabsorbent defined in claim 1 at issue can be considered to successfully achieve balanced results in terms of absorption and retention capacity. The problem solved by the invention is therefore to propose an alternative superabsorbent that achieves balanced results in terms of absorption and retention capacity.

2.3 Non-obviousness of the solution

Since neither D8 nor any of the other cited documents proposes a particle distribution as defined in claim 1 at issue, and since the cited prior art does not teach that adjusting such distribution would represent a way of achieving a superabsorbent with balanced absorption and retention properties, the subject-matter of claim 1 is not considered to be rendered obvious by the cited prior art.

2.4 The claims according to the main request therefore meet the requirements of Article 56 EPC.

3. In view of the above considerations, the board concludes that none of the objections raised in the decision under appeal, nor those put forward by the respondent during the appeal proceedings, prejudice the maintenance of the patent on the basis of the main request.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of claims 1-3 of the main request filed with submission of 9 January 2023, and a description to be adapted if appropriate.

The Registrar:

The Chairman:



A. Wille

J.-M. Schwaller

Decision electronically authenticated