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**D E C I S I O N**  
of 30 December 1993

**Case Number:** T 0484/92 - 3.3.3

**Application Number:** 87106968.8

**Publication Number:** 0245857.

**IPC:** C08G 18/48

**Language of the proceedings:** EN

**Title of invention:**  
Amphiphilic segment polyurethanes

**Applicant:**  
Takiron Co. Ltd.

**Opponent:**  
-

**Headword:**

**Relevant legal norms:**  
EPC Art. 84

**Keyword:**  
"Functional wording in claim sufficiently clear"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0484/92 - 3.3.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.3**  
**of 30 December 1993**

**Appellant:**

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**Decision under appeal:**

**Decision of the Examining Division of the  
European Patent Office dated 16 January 1992  
refusing European patent application No. 87  
106 968.8 pursuant to Article 97(1) EPC.**

**Composition of the Board:**

**Chairman:** F. Antony  
**Members:** R. Lunzer  
M. Aúz Castro

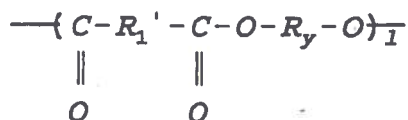


wherein (S) is selected from the group consisting of  
 (a) a polyalkylene oxide segment represented by the  
 following general formula (I):



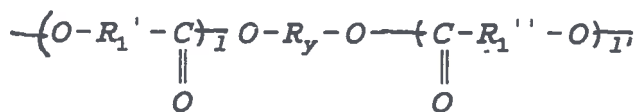
(I)

(b) an aliphatic polyester segment which is the  
 reaction product of a dibasic acid and a dihydric  
 alcohol represented by the following general formula  
 (II):



(II)

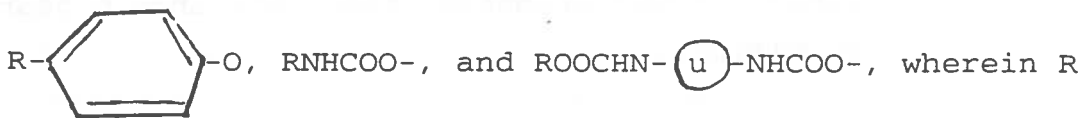
and (c) a polyester segment which is the reaction  
 product of a ring-cleaved polymer of a cyclic ester and  
 a dihydric alcohol represented by the following general  
 formula (III):



(III)

wherein  $R_1$  to  $R_x$  each represents an alkylene group  
 having from 7 to 2 carbon atoms, forming an alkylene  
 oxide segment;  $R_y$  represents an alkylene group of  
 polyesterforming dihydric alcohol;  $R_1'$  and  $R_1''$ , which  
 may be the same or different, each represents an  
 alkylene group having from 7 to 2 carbon atoms; -OX  
 represents a group selected from the group consisting

of RO-, RCOO-,



represents an alkyl group having 1 to 18 carbon atoms or a vinyl group and (u) represents an isocyanate skeleton group; -OX' represents a group selected from the group consisting of -OH, -OCl, -OBr and -OF; (A), (B) and (C), which may be the same or different, each represents an isocyanate skeleton group; m, n, p, l and l' each is a positive integer; l and l' may be the same or different; said polyurethane being a tapered hydrophobicity-hydrophilicity polyurethane where the degree of the hydrophilicity of hydrophobicity of each segment is regulated such that a stepwise relation of hydrophilic and hydrophobic segments is obtained from one end of the polymer molecule to the other, and the hydrophilicity or the hydrophobicity of the segments is tapered throughout the whole polymer molecule, and said polyurethane being at least a ternary polymer comprising at least three different segments selected from the group consisting of alkylene oxide segments and alkylene oxide polyester segments."

III. The objections of the Examining Division (pages 4 and 5 of the decision under appeal) were substantially as follows:

- (a) if, as had been argued on page 3 (second paragraph) of the Appellant's letter of 5 September 1991, the structural features, i.e. the choice of the number of carbon atoms and/or the molecular weight were compulsory for achieving the desired increase in hydrophilic properties of

the segments from one end of the molecule to the other, it was essential that this should feature in Claim 1;

- (b) where (S) is a polyester, there was no clear indication how such a polyester segment should be constituted (number of carbon atoms, molecular weight) as compared with an adjacent polyether segment in order to achieve the claimed property, and the examples did not show that this was actually attained;
- (c) reference to the theoretical solubility parameter was inappropriate for the determination of the hydrophilicity or hydrophobicity since the application did not disclose which of the numerous existing methods for the determination of this parameter had been used.

IV. An appeal against that decision was lodged on 11 March 1992, the appeal fee was paid on the same day, and the Grounds of Appeal were filed on 14 May 1992. In the Statement of Grounds of Appeal, the Appellant argued essentially that the claims which defined the alleged invention in functional terms were sufficiently clear, and that the skilled reader would be able to understand what steps were necessary in order to carry out the alleged invention. Attention was drawn to the fact that the introduction into Claim 1 of a structural feature, such as the number of carbon atoms and/or molecular weight, as proposed by the Examining Division, would unduly restrict the scope of the invention. It was also argued that the description and claims had been formulated so as to embrace methods of achieving the desired balance of hydrophobic/hydrophilic properties of the segments, not only by the control of the number

of carbon atoms and/or the degree of polymerisation, suggested in the description as one way of controlling those properties, but equally, e.g., by controlling the conformation of the segment molecules.

- V. By a letter dated 29 November 1993 the Appellant agreed with the suggestion which had been made by the rapporteur that in the above formula IV the statement that '-OX' could be -OH, -OCl, -OBr, or -OF, ought to be replaced by an indication that the intended options were -OH, -Cl, -Br, or -F, and the Claim is therefore regarded as having been so amended.
  
- VI. The Appellant requested that the decision under appeal be set aside, and a patent granted on the basis of the claims filed on 19 February 1991, and 5 September 1991 (AT and ES), subject to the above mentioned correction.

**Reasons for the Decision**

- 1. The appeal is admissible.
  
- 2. *Admissibility of amendment*

The above-mentioned correction is an obvious correction which is permissible under Rule 88 EPC, it being clear to the Board that nothing would have been intended to be at the end of the polyurethane segment other than a hydroxy group, or a halogen atom.

3. *Clarity and Support of the Claims (Article 84 EPC)*

3.1 Having regard to the nature of the objections raised by the Examining Division, the Board confines the substantive part of the present decision solely to the consideration of Article 84 EPC. The Examining Division will still need to give detailed consideration to all other issues.

3.2 It is very difficult to formulate any general rule covering all situations and determining whether in any given case the claims of a patent may contain a functional definition or generalisation of the particular disclosure. It is, however, well recognised that within limits, unless claims are permitted which extend beyond the particular technical means exemplified in a patent specification, the patentee's competitors would be free to take the benefit of the invention, while he would derive no practical exclusivity from the grant of a patent. As was indicated in T 68/85, OJ EPO 1987, 228, although generally it is preferable to define an invention in terms of positive technical features, nonetheless there are, not too infrequently, circumstances where functional features may be permissible, particularly if the invention cannot otherwise be defined more precisely without restricting its scope, and if the features as so defined are sufficiently clear for the skilled person.

3.3 The present application relates to amphiphilic segment polyurethanes, i.e. to block copolymers consisting of alkylene oxide or polyester containing hydrophilic/hydrophobic segments (as more closely defined in Claim 1) joined by polyurethane linkages, in which there is a stepwise gradation of the



hydrophilic/hydrophobic properties "tapered" throughout the whole polymer molecule. Thus, in general, one end of the molecule is hydrophilic, the opposite end hydrophobic, and there is a stepwise gradation in the balance of properties from one segment to the next along the length of the molecule.

3.4 In the application as filed, at page 13 line 1 to page 15 line 15, there is an explanation of one way in which the desired balance of properties along the polymer chain may be achieved, viz. by controlling the number of carbon atoms in the alkylene oxide units of each segment ( $R_1, R_2, R_3, \dots R_x$ ) and/or by controlling the molecular weight (degree of polymerisation) of each such segment. A more generalised statement of this gradation of properties along the length of the molecule was expressed in the description and claims as originally filed in the following terms:

"said polyurethane being a tapered hydrophobicity-hydrophilicity polyurethane" (page 8 lines 2 to 3 and end of original Claim 1).

3.5 The Board is in no doubt that the claims (and equally the description) are sufficiently clear, particularly having regard to the complexity of the subject-matter. The aim is to achieve a polymer chain having the defined gradation of properties. The substantial point raised in the present appeal is whether, having disclosed one mechanism for achieving that goal, i.e. by controlling the number of carbon atoms and/or the molecular weight of the segments identified above, the Appellant is entitled to claim the alleged invention in broad functional terms, i.e. in terms of the desired end effect, viz. the gradation of properties, irrespective of how it is achieved, or whether the

Appellant ought to be compelled, as was held by the decision under appeal, to limit the claims to the one means for achieving that goal described in detail.

3.6 The clarity of a claim, however, is not diminished by the mere breadth of the terms contained in it, if the meaning of such terms - either per se or in the light of the description - is unambiguous for the skilled reader (cf. T 238/88, "Crown ether/KODAK", OJ EPO 1992, 709). Therefore the real issue is not the clarity of Claim 1 as it stands, but whether it satisfies the second requirement of Article 84 EPC, that it must be supported by the description. In that respect the facts of the present case are distinguishable from those found in T 409/91 (18 March 1993, to be published in OJ EPO) in which it was held that there was no support for a general claim directed to wax particles below a given maximum size in a fuel oil, where the description disclosed only one way of controlling particle size; viz. by the addition of certain additives, and the skilled person would not have known, from the contents of the description or on the basis of common general knowledge, of any other way of attaining the desired particle size. In contrast, in the present case there are alternative ways of performing the invention at the disposal of the person skilled in the art, which would be apparent upon reading the description, based on his common general knowledge.

3.7 Under the heading "Detailed description of the invention", the specification explains (page 8, line 12 to page 9, line 4) that in the amphiphilic segment polyurethanes of the alleged invention, the degree of hydrophilicity or hydrophobicity of each segment is regulated, so as to achieve a stepwise and tapered gradation in these two properties from one end of the

polymer molecule to the other, and it is added at lines 5 to 8 of page 9 that "any structure exhibiting the relationship of tapered hydrophilicity-hydrophobicity in every adjacent segment groups [sic] falls within the scope of the present invention." Those words have of course to be read in the context of the other limitations as to the identity of the compositions which fall within the scope of the claims. The general description goes on over the following 30 pages, prior to the introduction of the Examples, to fill in details of how the desired gradation of hydrophilicity-hydrophobicity can be achieved in a wide range of compounds all falling within the scope of the claims.

In the light of this detailed disclosure, the Board is satisfied that the second requirement of Article 84 EPC, viz. support by the description, is met.

4. *Other findings*

Regarding some of the other findings of the Examining Division the Board makes the following comments in the light of what it sees as the main issue dealt with above.

- 4.1 An objection, taken in connection with Examples 2 and 3, was to the effect that - "there is no evidence in these Examples that the polyester segment has a greater hydrophobicity than the adjacent polypropylene glycol". With regard to that finding, no such "evidence", in the sense of proof, on the part of an applicant is to expected, **unless** the assertions made are not credible. If an Examining Division takes the view that despite following all the instructions given in an example the desired results are **not** attainable, it has the burden

of substantiating the point. As an Examining Division has neither the time nor the equipment for performing tests, at least it ought to back an objection of the kind which has been made here by some argument as to why it is of the opinion that an example is inherently unlikely to achieve the desired result.

4.2 Finally, reference was made by both the Appellant and the Examining Division to the document cited by the Examining Division, Polymer Engineering and Science, Vol. 19, No. 12, Sept. 1989. The Board has reviewed this document. It reflects a detailed investigation which led to the conclusion that there is some correlation, but not an exact one, between solubility parameters as calculated from molecular structure, and as found by testing (page 863 final paragraph of the article). In contrast, what concerns the present application is not absolute values of solubility, which in its turn is related to the hydrophilic/hydrophobic properties, but whether it can be shown, either on the basis of tests or on theoretical considerations, that the **relative** conditions specified in Claim 1 in suit are likely to be satisfied by the products of the examples of the patent in suit.

4.3 As was indicated recently by this Board in T 860/93 (29 December 1993, to be reported in OJ EPO) although it may be necessary to identify a method of testing when a parameter is expressed in numerical terms, where a relative quality is specified, such as solubility, the identification of a method of testing is not normally necessary. That proposition is particularly applicable to the present case, where all that is to be determined is the theoretical solubility parameter of one part of the molecule relative to another. Save for the situation where different methods of testing might

give inconsistent results in terms of **relative** solubility, it would not matter what method is used, with the consequence that a method need not be identified.

5. *Conclusion*

As the appeal on the issue of Article 84 EPC must be allowed, the case is referred back to the Examining Division for further examination.

**Order**

**For these reasons, it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order that the examination be continued.

The Registrar:

  
E. Goergmaier

The Chairman:

  
F. Antony

