BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:

(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [ ] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 17 June 2011

Case Number: T 0922/07 - 3.3.07

Application Number: 01306555.2

Publication Number: 1179732

IPC: B01J 20/26

Language of the proceedings: EN

Title of invention:
Polymeric adsorbent and method of preparation

Patent Proprietors:
ROHM AND HAAS COMPANY

Opponents:
GE Healthcare Bio-Sciences AB

Headword:
-

Relevant legal provisions:
EPC Art. 100(a)(b)
RPBA Art. 13, 15(3)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Sufficiency of disclosure (yes)"
"Novelty (yes)"
"Inventive step - main request (no)"
"Inventive step - auxiliary request (yes)"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0922/07 **-** 3.3.07

D E C I S I O N
of the Technical Board of Appeal 3.3.07
of 17 June 2011

Appellants: (Opponents)
GE Healthcare Bio-Sciences AB
Björkgatan 30
S-751-84 Uppsala (SE)

Representative:
-

Respondents: (Patent Proprietors)
ROHM AND HAAS COMPANY
100 Independence Mall West
Philadelphia
Pennsylvania 19106-2399 (US)

Representative:
Kent, Venetia Katherine
Patent Outsourcing Limited
1 King Street
Bakewell
Derbyshire DE45 1DZ (GB)

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 28 March 2007 rejecting the opposition filed against European patent No. 1179732 pursuant to Article 102(2) EPC 1973.

Composition of the Board:

Chairman: J. Riolo
Members: D. Semino
P. Schmitz

Summary of Facts and Submissions

I. The appeal of the opponents lies against the decision of the opposition division announced at the oral proceedings on 22 February 2007 to reject the opposition against European patent No. 1 179 732. The granted patent comprised 10 claims, independent claims 1 and 7 reading as follows:

"1. A macroporous polymer comprising polymerized monomer units of:
(a) 50 to 100 percent by weight of one or more polyvinylaromatic monomer, and
(b) zero to 50 percent by weight of one or more monounsaturated vinylaromatic monomer;
wherein the polymer has:
(i) a total porosity of 0.7 to 2 cubic centimeter per gram;
(ii) an operational mesoporosity of 0.7 to 1.9 cubic centimeter per gram;
(iii) an average particle size diameter of 2 to 600 microns;
(iv) a surface area of 200 to 1500 square meters per gram;
(v) a flow resistance value from 700 to less than 1,800 at 10 bar pressure and from 1,500 to less than 7,000 at 60 bar pressure; and
(vi) a total insulin capacity of 75 to 150 grams insulin/liter of polymer and a dynamic insulin capacity of 60 to 150 grams insulin/liter of polymer."

"7. A process for preparing a macroporous polymer comprising polymerizing zero to 50 percent monovinylaromatic monomer and 50 to 100 percent

polyvinylaromatic monomer, in the presence of 100 to 170 percent of a porogen mixture comprising a hydrophobic porogen and a hydrophilic porogen, and 0.5 to 10 percent free radical polymerization initiator, in an aqueous suspension; wherein all percent amounts are based on total weight of monomer; and wherein:
(a) the hydrophilic porogen is present in a weight ratio of greater than 1.2/1 up to 3/1 relative to the hydrophobic porogen; and
(b) the hydrophilic porogen is selected from one or more (C_4-C_{10})alkanol and the hydrophobic porogen is selected from one or more (C_7-C_{10})aromatic hydrocarbon and (C_6-C_{12})saturated hydrocarbon."

II. A notice of opposition was filed against the granted patent requesting revocation of the patent in its entirety on the grounds of lack of novelty, lack of inventive step and insufficiency of disclosure as set out in Article 100(a) and (b) EPC. The opposition was *inter alia* supported by the following documents:

D1: EP-A-1 018 367

D6: Cartier et al. "Characterisation of a Family of Polymeric Resins with Average Pore Diameters of 150Å, 300Å, and 1000Å for the Preparative Reverse Phase Purification of Polypeptides", Separations for Biotechnology 3, 1994, pages 100-105

D7: WO-A-00/11030

D11: Poinescu and Beldie, "Styrene Divinylbenzene Copolymers. Influence of Diluent Mixture on Matrix Structure", Die Angewandte Makromolekulare Chemie, 164 (1988), pages 45-58

D12: Li et al. "Novel Polystyryl Resins for Size Exclusion Chromatography", Journal of Polymer

Science: Part A: Polymer Chemistry, Vol. 32 (1994), pages 2029-2038

III. As far as relevant to the present decision, the decision of the opposition division can be summarised as follows:

(a) The information given in the patent in suit, in particular with respect to the determination of the flow resistance value, is sufficient to enable the skilled person to carry out the invention.

(b) The product of granted claim 1 is novel with respect to the disclosure in example 3 of D1, since no evidence is available to support the assumption that features (v) and (vi) (flow resistance and insulin capacity) are implicitly present in the polymers described therein.

(c) The process of granted claim 7 is inventive over D12 as the closest state of the art, which discloses dodecanol instead of a C_4-C_{10} alkanol as the hydrophilic porogen and a preferred porogen ratio of 50:50, since the skilled person attempting to provide a process for the production of macroporous polymers having surprisingly rigid polymer matrices and suitable for biomolecule separation and purification, while at the same providing satisfactory pressure and flow characteristics during RPC, would not find any incentive in the prior art to change the hydrophilic porogen or the porogen ratio according to the claimed process.

IV. The opponents appealed that decision. With the statement setting out the grounds of appeal they submitted the following documents (the references of the opponents have been left in parentheses):

E1: Sigma, Product Information, Insulin from Bovine Pancreas (Enclosure 1)
E2: Source™ 15RPC, Resource™ RPC, Data File from Pharmacia Biotech (Enclosure 2)
E3: Influence of pH on dynamic binding capacity (Enclosure 3)
E4: The effect of polymer size on ε (Enclosure 4)
E5: Venema et al., "Packed-column hydrodynamic chromatography using 1-µm non-porous silica particles", Journal of Chromatography A, 740 (1996), pages 159-167 (Enclosure 5)
E6: Variation in porogen mixtures, Table 3 of D11 (Enclosure 6).

V. In the course of the written phase of the appeal proceedings the patent proprietors filed 12 set of claims as auxiliary requests. Moreover, they submitted experimental results meant at reproducing example 3 of D1 (with letter of 21 December 2007) and the following documents (the references of the patent proprietors have been left in parentheses):

E7: Kopaciewicz et al., Journal of Chromatography A, 690 (1995), page 16
E8: Mant and Hodges, High-performance liquid chromatography of peptides and proteins, 1991, page 692
E9: Source® 15RPC, Source 15RPC ST 4.6/100, Resource® RPC, Data File from Amersham Biosciences (D35)

E10: Source® 30RPC brochure from Amersham Pharmacia Biotech (D36)

E11: Bulletin 863C from Supelco (D37).

VI. In the communication sent in preparation of the oral proceedings the Board with regard to the application of the problem-solution approach for the analysis of inventive step of process claim 7 of the patent as granted stated among others that "The question is to be answered whether the posed problem has been indeed solved with respect to the available prior art, which in the present case results in evaluating whether a minimal change in the porogen quantity (170 % instead of 172 % with respect to the total weight of the monomer) or the choice of a slightly different hydrophilic porogen (a (C_4-C_{10})alkanol instead of 1-dodecanol) may provide the desired advantages in separation properties and in pressure and flow characteristics" (point 3.4 of the communication).

VII. Oral proceedings were held on 17 June 2011 in the announced absence of the opponents. During the oral proceedings the patent proprietors filed a new auxiliary request I, which contained a single amendment in process claim 7 with respect to the claims as granted, claim 7 reading as follows (the addition with respect to the claim as granted is in bold):

"7. A process for preparing a macroporous polymer **according to claim 1** comprising polymerizing zero to 50 percent monovinylaromatic monomer and 50 to 100 percent polyvinylaromatic monomer, in the presence of 100 to 170 percent of a porogen mixture comprising a hydrophobic porogen and a hydrophilic porogen, and 0.5

to 10 percent free radical polymerization initiator, in an aqueous suspension; wherein all percent amounts are based on total weight of monomer; and wherein:
(a) the hydrophilic porogen is present in a weight ratio of greater than 1.2/1 up to 3/1 relative to the hydrophobic porogen; and
(b) the hydrophilic porogen is selected from one or more (C_4-C_{10})alkanol and the hydrophobic porogen is selected from one or more (C_7-C_{10})aromatic hydrocarbon and (C_6-C_{12})saturated hydrocarbon."

The same amendment was introduced in paragraph [0009] on page 3 of the description.

VIII. The arguments of the appellants (opponents), as far as relevant to the present decision, can be summarised as follows:

Sufficiency of disclosure

(a) The measurement of insulin binding capacity as described in Example 2 of the patent in suit is not reproducible since the adsorption buffer used for evaluation and its pH were not specified. The information available in the literature was not univocal as shown by E1, which hinted both at a pH of 2-3 and of about 8.4, D7, which related to the purification of insulin on macroporous polymers at pH 7-11, E2, which mentioned separation of bovine insulin in a solution of 0.1 percent trifluoroacetic acid (TFA) in water and purification of a novel growth factor at pH 8.3 and D6, which mentioned dynamic insulin binding measurements in 0.1 percent TFA for macroporous

polymers designed for medium pressure. Since measurement conducted at pH 3 and at pH 7.85 (E3) gave results for dynamic insulin capacity inside and outside the claimed range respectively, this resulted in lack of sufficient disclosure.

It was not possible to repeat the experiments of Example 3 regarding the measurement of interparticle void volume, which was used to calculate the flow resistance value, because neither the size of the macroporous particles, nor the one of the probe particles were given. Since the results were strongly dependent on the ratio of the two sizes, as shown by a theoretical formula available in the art (E4), and other disregarded phenomena, such as hydrodynamic chromatography (E5), might occur and might influence the results of the measurements, the specification lacked adequate instructions on how to determine the interparticle void volume and was therefore insufficient.

There was no support in the patent in suit for the broad intervals given for the product properties in granted claim 1 and the process conditions in granted claim 7, so that the description was insufficient also in this respect. The disclosure was also insufficient as to how to obtain a product with the desired flow resistance and insulin binding properties.

Novelty

(b) Example 3 of D1 described a polymer which fulfilled the composition, porosity and surface area conditions of granted claim 1. Since the additional features of the product, including in particular the flow resistance values and the insulin capacities, were a result of its process of preparation, they were intrinsic features of the product, so that claim 1 lacked novelty with respect to D1.

Inventive step

(c) D11 disclosed all the features of the process of granted claim 7 with the exception of the specific quantity of the porogen mixture (172 percent instead of a value in the range 100 to 170 based on the monomer weight). The upper limit of 170 percent appeared to have been arbitrarily selected merely to delimit the invention from the prior art. There was no experimental evidence to support the specific value as upper limit. The problem to be solved was to prepare a macroporous polymer, which presented acceptable rigidity while still having an acceptable porosity to allow binding. It was well known that a smaller amount of porogen would result in a less porous polymer and D11 itself indicated in several instances the importance of the amount of polymer. It would be obvious therefore for the skilled person aiming at making further modifications to vary the amount of porogen and arrive at the process of claim 7.

Starting from D12, whose disclosure differed from the process of claim 7 only in that the hydrophilic porogen was dodecanol instead of a (C_4-C_{10})alkanol, lack of inventive step could equally be derived.

The appellants did not raise any objection in the appeal proceedings against lack of inventive step of the product of granted claim 1, nor against lack of novelty of the process of granted claim 7.

IX. The arguments of the respondents (patent proprietors), as far as relevant to the present decision, can be summarised as follows:

Sufficiency of disclosure

(a) A person skilled in the art would prepare bovine insulin solutions at a low pH (2-3) by dissolving insulin in water containing 0.1 percent TFA buffer, as indicated in D6, E7, E8, E9, E10 and E11. There was no reason to deviate from using low pH solutions for determining the total and dynamic insulin capacities even in view of E1, which disclosed that bovine insulin was soluble in 125 mM $NaHCO_3$, but not that this was a normal preparation for evaluating insulin capacities.

Example 3 of the patent in suit set out the procedure required to determine the parameters necessary to calculate the flow resistance and the was no evidence that a person skilled in the art would not be able to follow this procedure. It was without doubt that there were many variables to

consider, but the necessary capabilities to evaluate flow resistance were well within the scope of a team of appropriately skilled persons.

There was no reason to believe that the claims were unduly broad. Moreover, while the flow resistance and the insulin capacity properties were intrinsic features of the claimed product, they were not an inevitable results of the other parameters specified in claim 1. Instead they could be obtained by means of the choice of appropriate process conditions. The worked examples in the patent in suit could be readily repeated by a person skilled in the art.

Novelty

(b) Reproduction of Example 3 of D1 showed that the flow resistance values at 10 and at 60 bar pressure and the dynamic insulin capacity were outside the ranges of granted claim 1, so that novelty had to be acknowledged.

Inventive step

(c) The process of claim 7 differed from D11 in that the percent of a specified porogen mixture was 100 to 170 with respect to the weight of monomer. There was no reason to doubt that the benefits of the invention in terms of separation and resistance characteristics were achieved across the whole scope of the process claim. In particular the appellants had not provided any evidence to show that it was not the case.

Therefore, the problem to be solved with respect to D11 was to provide a production process for a macroporous polymer with improved separation and resistance characteristics. There was no disclosure in D11 to use a specific porogen mixture in a specified amount in the expectation of achieving a macroporous polymer having unique beneficial properties. In particular there was no information in D11 about the mechanical rigidity and the separation characteristics of the obtained polymers. Therefore the presence of an inventive step should be acknowledged.

The same result was obtained starting from D12 as the closest state of the art in view of the different choice of hydrophilic porogen (dodecanol instead of (C_4-C_{10})alkanol).

X. The appellants (opponents) had requested in writing that the decision under appeal be set aside and that the European patent be revoked.

XI. The respondents (patent proprietors) requested that that the appeal be dismissed and the patent be maintained as granted. Alternatively, they requested that the decision under appeal be set aside and that the patent be maintained on the basis of auxiliary request I submitted during the oral proceedings before the Board or any of the auxiliary requests filed during the appeal procedure.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. *Sufficiency of disclosure*

2.1 Example 2 of the patent in suit (paragraphs [0057] to [0060]) outlines the procedure for measuring the total and the dynamic insulin capacity of the polymer. The packing of the polymer slurry into a glass column is described first (paragraph [0058]) and then information about how a solution of bovine insulin is pumped into the column (paragraph [0059]) and of the recordings necessary to determine the capacity values (paragraph [0060]) are given.

2.1.1 The opponents cited E1, D7 and E2 in order to show that the solution of bovine insulin used in these measurements could be one with a high pH.

2.1.2 E1 provides general properties of bovine insulin and discloses that it can also be solubilised in 125 mM $NaHCO_3$, but that the use of alcaline solutions is not recommended (page 2, third paragraph). The use of bovine insulin in measurements of total and dynamic capacity is not mentioned.

2.1.3 D7 relates to the chromatographic purification of insulin by means of pressure-stable polymeric material at pH between 7 and 11 (claim 1). The fact that a good separation takes place in this basic range is defined as surprising (paragraph bridging pages 5 and 6). The

use of these basic solutions for capacity measurements is not mentioned.

2.1.4 E2 mentions that a novel growth factor which was found to be unstable at low pH could be purified at pH 8.3 with good recovery of biological activity (page 4, second paragraph). With reference to bovine insulin and measurements of binding capacity it mentions however a low pH solution (0.1 percent TFA in water, page 2, figure 4).

2.1.5 None of these documents therefore is able to support the view that the skilled person would envisage the possibility of measuring total and dynamic insulin capacity at high pH. On the contrary, all the documents available on file which refer to this kind of measurements (D6, abstract, table 1 and "Feed for column runs" on page 106; E2, table 1 and figure 4; E9, table 1 and figure 4; E10, table 1; E11, table 4), mention the use of low pH solutions, typically of TFA in water, as supported by the proprietors.

2.1.6 The fact that different results are obtained when measuring dynamic insulin capacity at high and low pH (E3) has therefore no bearing on the reproducibility of the measurements, since in view of the available prior art it is not credible that the skilled person would consider carrying out the measurements at high pH. Since there are no concerns about the reproducibility of the insulin capacity measurements, the objection of the opponents of insufficiency of disclosure related to this issue is not successful.

2.2 Example 3 of the patent in suit (paragraphs [0061] to [0066]) describes the evaluation of the flow resistance value by means of the determination of the interparticle void volume ε through measurement of the total void volume, the void volume external to the polymer particles and the bed volume followed by the use of equation 3 (paragraph [0039]).

2.2.1 The opponents contested the reproducibility of example 3, since example 3 gave broad ranges for the size of the macroporous polymer particles and of the probe particles used to measure the void volume external to the polymer particles and an empirical formula (given in E4) showed that very different results could be obtained according to the ratio of the two sizes. Moreover, the phenomena known as "hydrodynamic chromatography" (E5), which might have a strong impact on the measurements, had not been taken into account.

2.2.2 While it can be credible from a physical point of view that the probe particle size may have an impact on the measurement of the void volume external to the particle, if the choice is not accurately taken, no weight can be given to an empirical formula (the one in E4), which has been cited out of context (it is apparently taken from a paper which has not been submitted) and for which therefore neither the assumptions made for its validity, nor even the meaning of the used parameters are known.

2.2.3 In the absence of sufficient evidence it cannot be put in doubt that the skilled person would be able to choose the proper values of the relevant parameters (in

particular the probe particle size) in order to accomplish reliable measurements.

2.2.4 E5 relates to the separation of soluble synthetic polymers through the use of non-porous spherical silica particles in packed columns by means of a phenomenon known as hydrodynamic chromatography (abstract and introduction). No mention is made in the document of possible errors in the measurement of the void volume external to the particle in experiments like the one of example 3 of the patent in suit due to this kind of phenomenon, so that also E5 is not relevant.

2.2.5 With regard to the evaluation of flow resistance values by means of the procedure of example 3 of the patent in suit no evidence is therefore available to put reasonably in doubt the reproducibility of the measurements, so that no problem of insufficiency of disclosure arises.

2.3 The breadth of the ranges of the product properties in claim 1 and of the process conditions in claim 7 cannot be objected to under lack of sufficiency of disclosure, unless there is evidence that products with properties belonging to the ranges cannot be obtained or processes with operating conditions within the ranges cannot be carried out. Since the opponents have not provided any experimental evidence in this respect, also the objection that the invention is not sufficiently disclosed to be carried out due to the breadth of the ranges must fail.

2.4 In the patent in suit it is asserted that by using specific porogen solvents in specific proportions

relative to the monomer phase under specific polymerisation conditions polymers without significant compressibility (as measured by the flow resistance at different pressures) are obtained while maintaining good throughput and capacities (as measured by the total and dynamic insulin capacities) (paragraph [0011]). Specific detail on the porogen solvents, their quantities and the process conditions are then given (in particular in paragraphs [0027] and [0028]).

2.4.1 The examples (see in particular tables 1 and 2) show that, by changing the quantity of porogen relative to the monomer and the molar ratio of the porogens, polymers according to claim 1 (examples 1-5 to 1-9) or polymers with surface area and porosity according to claim 1, but with unsatisfactory values of the flow resistance or of the insulin capacities (see e.g. example 1-3C) can be obtained.

2.4.2 In view of these disclosures and in the absence of any contrary evidence on the side of the opponents, their allegation that either the values of flow resistance and insulin capacity directly follow from the surface area, porosity and particle size of the polymers or there is no sufficient information as how the former properties can be obtained, can therefore not be accepted.

3. *Novelty of product claim 1*

3.1 Document D1 discloses a macroporous polymeric adsorbent comprising monomer units of from 50 to 100 percent by weight of one or more polyvinylaromatic monomer, and from zero to 50 percent by weight of one or more

monounsaturated vinylaromatic monomer, wherein the adsorbent contains less than 0.5 millimole vinyl groups per gram, has a surface area of greater than 700 m^2/g, has a mesoporosity of greater than 0.7 cm^3/g, and has a swelling ratio in organic solvent of less than 10 percent by volume (claim 1).

3.2 This product is developed to provide high surface area macroporous adsorbents having improved swelling properties, that is, a reduced tendency to swell in solvents during the adsorption/regeneration cycles of typical end use applications (paragraph [0007]).

3.3 In particular, example 3 of D1 concerns a macroporous copolymer substrate obtained by using toluene as porogen and containing 80 percent divinylbenzene (a polyvinylaromatic monomer) and 20 percent ethylvinylbenzene (a monovinylaromatic monomer) having a total porosity of 1.60 cm^3/g, a mesoporosity of 0.95 cm^3/g and a surface area of 905 m^2/g (paragraph [0048]). The macroporous copolymer precursor was postcrosslinked (paragraphs [0046] with reference to paragraph [0045]). The average particle size diameter of the polymer is not given.

3.4 According to the reproduction of the example by the patent proprietors (filed with letter of 21 December 2007), which has not been contested by the opponents, the flow resistance values at 10 and 60 bar pressures are 1964 and 13318 respectively and the total and dynamic insulin capacity are 95 and 39 grams insulin/litre of polymer respectively for the copolymer precursor and 93 and 37 grams insulin/litre of polymer respectively for the crosslinked copolymer.

3.5 Example 3 does not provide the quantity of porogen used in the polymerisation process. However, the general disclosure of D1 specifies that in a typical preparation process 2 to 5 parts (200 to 500 percent) porogen per one part monomer are used (paragraph [0017]).

3.6 Example 3 of D1 differs therefore from the product of granted claim 1 at least in the flow resistance values at 10 and 60 bar pressure and in the dynamic insulin capacity. Indeed there is no hint in D1 to the relevance of the pressure and flow characteristic of the product.

3.7 The fact that the flow resistance values at 10 and 60 bar pressure and the dynamic insulin capacity of the product of example 3 of D1 differ from the ones of the claimed product is not unexpected, nor can it lead to any doubt on sufficiency of disclosure as submitted by the opponents, since there are clear differences between the process of D1 and the process described in the patent in suit as appropriate to obtain the claimed product, in particular relating to the features which are indicated as crucial in the patent (see paragraph [0027] in the patent), namely the use of a mixture of a hydrophobic and a hydrophilic porogen and an amount of porogen in the range 100 to 170 percent based on the total weight of monomer.

3.8 Since no other disclosure in D1 comes closer to the product of granted claim 1, novelty of such a product with respect to D1 must be acknowledged.

4. *Novelty of process claim 7*

4.1 Novelty of the process of granted claim 7 has not been challenged by the opponents. However, a preliminary analysis of novelty with respect to the documents which have been considered by the parties as the closest state of the art is appropriate for a proper analysis of inventive step.

4.2 D11 discloses porous beads of styrene divinylbenzene copolymers with good characteristics and their method of preparation (title and summary).

4.2.1 The beads are prepared by pouring a mixture of styrene (a monovinylaromatic monomer) and divinylbenzene (a polyvinylaromatic monomer), benzoyl peroxide (a free radical polymerisation initiator at 1.0 percent based on the monomer weight) and variable volumes of a diluent mixture into an aqueous solution and performing the reaction (page 49, Preparation of Porous Copolymers).

4.2.2 Several series of experiments are conducted including one in which 2-ethyl hexylalcohol (a C_8 alcohol) and toluene (a C_7 aromatic hydrocarbon) are used as diluents according to the quantities as indicated in table 3 (page 54 of D11). With reference to these experiments, the quantities of 2-ethyl hexylalcohol and toluene and the total quantity of their mixture computed as percent based on the total weight of the monomer have been submitted by the opponents in E6 based on the information in Table 3 of D11. According to these data, which have not been contested by the patent proprietors, sample 29 has been obtained starting with 61 percent of

divinylbenzene in the monomer mixture, using 171.9 percent with respect to the weight of the monomer of the mixture of 2-ethyl hexylalcohol and toluene and with a ratio of 2-ethyl hexylalcohol to toluene of 2.9/1. In sample 28 still 61 percent divinylbenzene, 172.6 percent porogen and a ratio of 1.4/1 between the diluents are used. In samples 22 and 23 roughly similar quantities of diluents (172.7 percent and 171.6 percent respectively) and similar ratios between the diluents (1.4/1 and 3/1 respectively) are used with a mixture of monomers containing 50 percent of divinylbenzene.

4.2.3 The products of samples 22, 23, 28 and 29 have a pore volume of 1.92, 2.4, 2.2 and 2.48 ml/g respectively and a surface area of 362.2, 247.03, 582.4 and 356.4 m^2/g respectively (table 3). The mesoporosity and the average particle diameters are not given in D11. Also polymer compressibility and insulin capacity are not measured.

4.2.4 The process of granted claim 7 differs from the processes of samples 22, 23, 28 and 29 of D11 only in the quantity of porogens (which is only marginally different with values around 172 percent as opposed to a range of 100 to 170 percent in granted claim 7).

4.3 D12 discloses resins for size exclusion chromatography based on divinylbenzene (a polyvinylaromatic monomer) and on mixtures of 1,2-bis(p-vinylphenyl)ethane (a polyvinylaromatic monomer) and p-methylstyrene (a monovinylaromatic monomer) polymerised in the presence of different porogens to give particles of about 5 µm in average diameter (title and synopsis).

4.3.1 The polymers are prepared (page 2030, section "Preparation of Porous Resins", spanning between the two columns) by polymerising the monomers with an initiator (3.4 percent of AIBN relative to the monomer) in the presence of around 140 percent total porogen with respect to the monomer (a ratio porogen vs. monomer of 1.4/1 in volume is given which due to the very similar densities of the organic materials corresponds roughly to the value of 140 percent). The porogens are dodecanol (a C_{12} alkanol) and toluene (a C_7 aromatic hydrocarbon). Resin B2 is obtained from a mixture of 50 percent of 1,2-bis(p-vinylphenyl)ethane and 50 percent of p-methylstyrene, while resin D4 results from the polymerisation of divinylbenzene (Table I). In both cases the ratio dodecanol to toluene is 1.5/1 (60/40 in Table I).

4.3.2 The products of samples B2 and D4 have a pore volume of 0.342 and 0.645 ml/g respectively and a surface area of 46.7 and 177.7 m^2/g respectively (Table II). The data on the porosity in Table II are not sufficient to compute the mesoporosity of the samples. Moreover, polymer compressibility and capacity for insulin separation are not measured.

4.3.3 The process of granted claim 7 differs from the processes of samples B2 and D4 of D12 only in the hydrophilic porogen (a (C_4-C_{10})alkanol instead of a dodecanol).

5. *Inventive step of product claim 1*

5.1 Even though the inventiveness of the product of granted claim 1 has not been challenged by the opponents, the

Board finds it appropriate to analyse it, since it is closely related to the inventiveness of the process of claim 7 of auxiliary request I.

5.2 The object of the patent in suit is "to provide a macroporous polymer stationary phase suitable for biomolecule separation and purification, while at the same providing satisfactory pressure and flow characteristics during RPC" (paragraph [0006] in the patent).

5.3 None of the documents which have been cited by the opponents for the analysis of novelty and inventive step addresses the same object as the patent in suit. Since the closest product disclosed in the prior art is the one of example 3 of D1, this is taken as the closest state of the art.

5.4 As discussed above (see point 3.4 and 3.6) this product has a higher flow resistance at 10 and 60 bar and a lower dynamic insulin capacity than the ones of the product of claim 1, therefore definitely worse pressure/flow characteristics and insulin separation properties.

5.5 The technical problem to be solved with respect to the product in D1 is therefore to provide a macroporous polymer with improved mechanical and separation properties. Having regard to the available information, the Board is convinced that the problem has been solved by the subject-matter of claim 1.

5.6 There is no mention in the available prior art of such a problem, nor any indication that a macroporous

polymer as the one claimed could be obtained or even should be aimed at. Therefore, the product of granted claim 1 involves an inventive step with regard to the state of the art.

6. *Inventive step of process claim 7*

6.1 Starting from the object of the patent in suit as outlined above (point 5.2) and considering that none of the documents which have been cited by the opponents for the analysis of novelty and inventive step addresses such an object, D11 is to be considered as the closest state of the art, since its examples disclose processes for the preparation of macroporous polymers which differ from the process of granted claim 7 only marginally in one of the operating conditions (the quantity of porogens with values around 172 percent based on the monomer weight as opposed to a range of 100 to 170 percent in granted claim 7).

6.2 No comparative data are available to show the properties of the products of D11 in terms of pressure/flow and insulin separation characteristics and what effect a minimal variation in the porogen quantity (from 171.5 to 170 percent) could have on the obtained product. While it can be accepted in the absence of data that the products of D11 are different from the ones claimed in the patent in suit and that they do not possess the favourable pressure/flow and insulin separation properties, by the same token and in the absence both of comparative data and of a reference in claim 7 to the product of claim 1, it cannot be assumed that a reproduction of the process according to the examples of D11 (in particular samples 22, 23, 28

and 29) while changing only the porogen quantity to 170 percent could result in a product with improved properties. In other words, it is not credible in the absence of evidence that such a small difference in one operating condition could lead to the product as claimed in claim 1 or even to an improved product.

6.3 Starting from the process of D11, the problem to be solved is therefore simply to provide a further process for the production of macroporous polymers.

6.4 The skilled person attempting to solve the posed problem, would consider any minimal change in the operating conditions, as the one of using a porogen quantity of 170 percent with respect to the weight of monomer instead of 171.5 percent, as an obvious possibility, which he would undertake without any inventive activity.

6.5 For these reasons, the process of granted claim 7 does not involve an inventive step.

Auxiliary request I

7. In view of the acknowledgment of novelty and inventive step for the product of granted claim 1 the patent proprietors filed during oral proceedings auxiliary request I in which process claim 7 had been amended by introducing a reference to the preparation of a macroporous polymer according to claim 1.

7.1 Such an auxiliary request does not give rise to any new issue, since the analysis of inventive step of the amended process claim (which is the only open issue)

follows directly from the analysis of the unamended product claim.

7.2 On this basis the Board decides to admit the request into the proceedings (Article 13 of the Rules of Procedure of the Boards of Appeal). The absence of the duly summoned opponents at the oral proceedings did not require any postponement of the decision in view of the dispositions of Article 15(3) of the Rules of Procedure of the Boards of Appeal, as reinforced in this case by the absence of any new issue related to the newly filed request.

7.3 By means of the amendment the process of claim 7 of auxiliary request I is limited to the specific operating conditions which allow to obtain a product with the properties as listed in claim 1. The product of claim 1 is novel and inventive (see points 3 and 5 above), which confers novelty and inventive step to the method for its production.

7.4 On this basis the only objection on which the main request fails does not hold for auxiliary request I.

7.5 Since the description of the patent in suit has been amended by introducing in paragraph [0009] (which discloses the process according to the invention) the same amendment as in claim 7 according to auxiliary request I, no objection can be raised on the adaptation of the description.

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 on the basis of the following documents:

   - claims 1 to 10 of auxiliary request I submitted during the oral proceedings before the Board,

   - description of the patent as granted with replacement page 3 submitted during the oral proceedings before the Board.

The Registrar The Chairman

S. Fabiani J. Riolo