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DECISION
of 19 January 2006

Case Number:	T 0041/02 - 3.3.03
Application Number:	95402199.4
Publication Number:	0705854
IPC:	C08F 220/30
Language of the proceedings:	EN

Title of invention:
Polymers useful as pH responsive thickeners and monomers therefor

Patentee:
RHODIA INC.

Opponent:
Coatex S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 55(1)(a), 54, 56

Keyword:
"Non-prejudicial disclosure (no)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
G 0001/03, T 0291/97

Catchword:
-

Case Number: T 0041/02 - 3.3.03

DECISION
of the Technical Board of Appeal 3.3.03
of 19 January 2006

Appellant: (Opponent)	Coatex S.A. B.P. 8-35 rue Ampere Z.I. Lyon-Nord F-69730 Genay (FR)
Representative:	Richebourg, Michel François Cabinet Michel Richebourg "Le Clos du Golf" 69, rue Saint-Simon F-42000 Saint Etienne (FR)
Respondent: (Proprietor of the patent)	RHODIA INC. CN 7500, Prospect Plains Road Cranbury New Jersey 08512 (US)
Representative:	Boittiaux, Vincent Rhodia Services Direction de la Propriété Industrielle 40, rue de la Haie-Coq F-93306 Aubervilliers Cedex (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office dated 6 November 2001 and posted 29 November 2001 concerning maintenance of European patent No. 0705854 in amended form.**

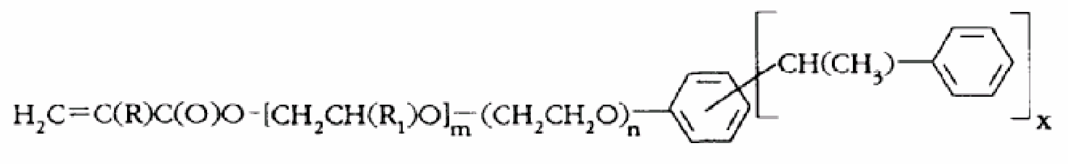
Composition of the Board:

Chairman: R. Young
Members: W. Sieber
C. Heath

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 705 854, in respect of European patent application no. 95 402 199.4 in the name of Rhone-Poulenc Inc. (later transferred to Rhodia Inc.), filed on 2 October 1995 and claiming a US priority of 3 October 1994 (US 317261), was published on 15 April 1998 (Bulletin 1998/16). The granted patent contained 27 claims, whereby Claims 1 and 6 read as follows:

"1. An ethylenically unsaturated biphillic monomer of the formula:



wherein R and R_1 represent hydrogen or methyl, n is an average number from 6 to 100, m is an average number of from 0-50 provided that n is > or = m and SIGMA (m + n) is an average number from 6-100, and x is an average number of from 2 to 3.

6. A liquid emulsion polymer useful as a pH responsive thickener for aqueous compositions comprising an aqueous emulsion copolymer of:

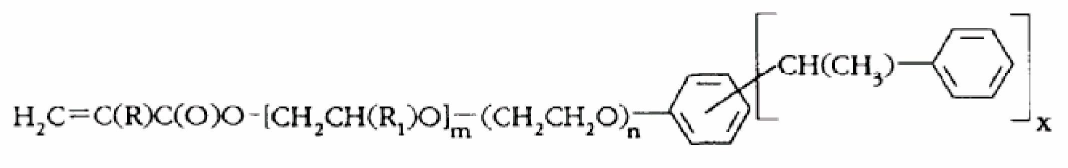
A. 15-60 weight percent based on total monomers of at least one C_3-C_8 ethylenically unsaturated carboxylic acid monomer;

B. 15-80 weight percent of at least one nonionic, copolymerizable C_2-C_{12} alpha, beta-ethylenically unsaturated monomer of the formula:

Formula III. $CH_2=CYZ$

wherein when Y is H, Z is $-COOR'$, $-C_5H_4R''$, CN, Cl, $-OC(O)R'''$ or $-CH=CH_2$; Y is CH_3, Z is $-COOR'$, $-C_5H_4R''$, CN or $-CH=CH_2$; or Y and Z are Cl; and R' is C_1-C_8 alkyl or C_2-C_9 hydroxyalkyl; R" is H, Cl, Br, or C_1-C_4 alkyl; and R"' is C_1-C_8 alkyl; and

C. 1-30 weight percent based on total monomers of at least one nonionic ethylenically unsaturated biphillic monomer of the formula:



Formula I.

wherein R and R_1 represent hydrogen or methyl, n is an average number from 6 to 100, m is an average number of from 0-50 provided that n is > or = m and SIGMA (m + n) is an average number from 6-100, and x is an average number of from 2 to 3, wherein the substituent denoted by x is randomly distributed around the benzene ring to which it is attached, said polymer being stable as an aqueous colloidal dispersion at a pH lower than about 5.0 but becoming an effective thickener for aqueous systems upon adjustment to a pH of 5.5-10.5 or higher".

The remaining claims are not of importance for this decision and consequently they will not be considered in further detail.

II. A notice of opposition was filed on 12 January 1999 by COATEX S.A. requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of novelty and lack of inventive step).

The following documents were cited (*inter alia*) in the opposition procedure:

D1: EP-A-0 705 852;

D2: FR A-2 693 203;

D12: EP-B-0 350 414;

D13: US-A-5 082 591;

D15: US-A-5 292 828;

D16: EP-A-0 349 383;

D17: US-A-5 082 591;

D18a: Declaration by J.A. Shedden (submitted by the proprietor);

D18b: E-Mail from Jim Cowie (submitted by the proprietor); and

D18c: Copy of Secrecy agreement (submitted by the proprietor).

III. During prosecution of the case before the opposition division, an amended set of Claims 1-27 was filed by the proprietor as an auxiliary request.

(a) Claim 1 of the auxiliary request corresponded to Claim 1 as granted except that the definition of x was amended to "x is an average number of from 2 to <u>less than</u> 3" (amendment underlined).

(b) Claim 6 of the auxiliary request) corresponded to Claim 6 as granted, except that the last part of the claim was amended to read as follows (amendments underlined):

"… C. 1-30 weight percent based on total monomers of at least one ethylenically unsaturated biphillic monomer <u>according to Claim 1</u>."

(c) The remaining claims were identical with the corresponding granted claims apart from a clerical amendment in Claims 15, 18, 21 and 24 (the term "Compound of Formula I" was substituted by the term "ethylenically unsaturated biphillic monomer according to Claim 1").

IV. By an interlocutory decision which was announced orally on 6 November 2001 and issued in writing on 29 November 2001, the opposition division maintained the patent in amended form according to the proprietor's auxiliary request.

(a) According to the decision of the opposition division, the subject-matter of Claim 1 as granted lacked novelty over D1 (Article 54(3) EPC). D1 was considered to be an "opposable" document because an evident abuse in the filing of D1 had not been proven (Article 55(1)(a) EPC).

(b) As regards the claims of the auxiliary request, it was held that they met the requirements of Articles 123, 54 and 56 EPC.

V. On 9 January 2002, the appellant (opponent) filed a notice of appeal against the above decision with simultaneous payment of the prescribed fee.

The appellant's arguments filed with the statement of grounds of appeal on 27 March 2002 and with the letters dated 25 October 2005 and 16 December 2005 may be summarized as follows:

(a) The appellant agreed with the decision under appeal that D1 was not a non-prejudicial disclosure within the meaning of Article 55(1)(a) EPC. There was no evidence of any fraud or abuse associated with the filing of D1, let alone an evident abuse. In fact, there were several plausible scenarios (eg misunderstanding, clerical error about a common date of filing, change of mind of the patentee) which did not support an evident abuse. Furthermore, the proprietor neither tried to regain control or ownership of D1 nor sued Rheox Inc. for fraudulent filing of D1. This was definitely not the behaviour of a party discovering an alleged fraudulent filing creating a novelty bar.

(b) For a skilled person reading D1, the monomer DV-4343 disclosed therein was not and could not be under any circumstances a pure tristyryl phenol monomer since the reaction involved in the preparation of DV-4343 could not be selective and inevitably produced a mixture of mono-, di- and tristyryl phenol. Thus, the product DV-4343 disclosed in D1 was actually a mixture as claimed in amended Claim 1 maintained by the opposition division (ie with x being an average number of from 2 to less than 3). To support this argument, the following documents were filed:

D19a: Declaration by J.M. Suau dated 27 March 2002;

D19b: Allinger et al, Chimie Organique, McGraw Hill (1987), page 378;

D20: Study from Elf Atochem dated 4 July 1997; and

D21: Declaration by O. Guerret dated 21 October 2005 (and English translation thereof).

(c) Furthermore, the appellant raised a novelty objection in view of D12.

(d) The claimed subject-matter was also not based on an inventive step.

D2 was considered to represent the closest prior art because it related likewise to copolymers acting as a rheological modifier in various domains and addressed the same technical problem as the patent in suit, namely the thickening of aqueous compositions under low shear. When trying to modify the surfactant monomer of D2, a person skilled in the art would focus on the terminal group of the surfactant monomer and not on the alkoxylated backbone because that part of the molecule had been kept for decades in surfactant monomers. Thus, the objective technical problem was to find a terminal (*in situ* bound) surfactant group better than those used in the prior art.

Styryl phenol groups were the obvious or at least privileged candidates because they represented a new trend in surfactant chemistry, as demonstrated by D12, D13, D16 and D17. A new trend was regarded as more attractive, especially because the chances of reaching an innovation were higher in that case. Furthermore, the steric factor, an important parameter for a surfactant moiety (as apparent from D15) also pointed towards styryl phenol groups.

VI. The submissions of the respondent (proprietor) presented in its letters dated 14 October 2002 and 18 November 2005 may be summarized as follows:

(a) D1 should be recognized as a non-prejudicial disclosure within the meaning of Article 55(1)(a) EPC. There existed a secrecy agreement between Rheox Inc., the applicant of D1, and Rhone-Poulenc

Inc., the legal predecessor of the respondent, relating to the field of rheological additives. This agreement covered the monomer DV-4343 disclosed in D1. The filing of D1 without prior consultation and/or information of Rhone-Poulenc Inc. was considered to be a breech of the secrecy agreement. To support this argument, declarations D23 and D24 were submitted:

D23: Declaration by M.J. Cronin dated 17 November 2005; and

D24: New Declaration by J. Shedden dated 17 November 2005.

(b) D1 disclosed the monomer DV-4343 as being a polyethoxylated tristyryl phenol methacrylate. The tristyryl phenol group had exactly three styryl moieties as apparent from the formula on page 7. D1 neither disclosed nor suggested the presence of any other hydrophobic group in the definition of the monomer, and, therefore, could not anticipate a monomer having an average number for x of 2 to less than 3. Since D1 did not disclose DV-4343 as being a mixture of monomers containing different styryl phenol groups, the question of whether the compound actually provided by Rhone-Poulenc Inc. was purified or not, or whether there was an incentive for purifying it with workload impact was not relevant.

Furthermore, it was noted that D1 did not disclose the complete formula of DV-4343, namely the exact number of the ethylene oxide units. Even if the priority document of D1 did, this had to be disregarded in the evaluation of D1. In this context, the priority document was filed.

D22: Priority document of Dl (US 315000).

(c) D12 did not anticipate the claimed subject-matter since it described monomers having in their structure urethane group(s) -OCO-NH- derived from isocyanate groups. The present claims were directed to monomers that did not include urethane group(s).

(d) It was agreed that D2 represented the closest prior art. The objective problem to be solved had to be seen in the provision of copolymers with improved rheological properties, including maximum viscosity at lower pH. As shown by the last comparative example in the patent in suit, the hydrophobic moiety in the monomer had an influence on rheology: the monomer of the invention provided high viscosity at low shear and had a shear thinning rheology, whereas the comparative monomer with another hydrophobic group had a lower viscosity at low shear and a substantially Newtonian (non-shear thinning) rheology. The documents relied upon by the appellant did not suggest that a monomer as defined in Claim 1 would provide these effects. On the other hand, the appellant's arguments merely addressed the possibility of finding surfactant moieties to be bound to polymerizable groups and, therefore, were not sufficient to show obviousness. There was also no basis in any document for identifying a trend in the field of surfactants towards styryl phenol groups. Such a trend was made-up from an incomplete *ex post facto* extraction of information.

VII. With the letter dated 18 November 2005 the respondent filed a new main request and auxiliary requests 1-3.

(a) The main request was identical with the auxiliary request before the opposition division (point III, above), except that the last part of Claim 6 was amended to read as follows (amendments underlined):

"… C. 1-30 weight percent based on total monomers of at least one nonionic ethylenically unsaturated biphillic monomer according to claim 1, wherein the substituent denoted by x is randomly distributed around the benzene ring to which it is attached, said polymer being stable as an aqueous colloidal dispersion at a pH lower than about 5.0 but becoming an effective thickener for aqueous systems upon adjustment to a pH of 5.5-10.5 or higher".

(b) Auxiliary requests 1-3 are not of importance for this decision and consequently they will not be considered in further detail.

VIII. On 19 January 2006, oral proceedings were held before the board. The issues discussed related to Article 55(1)(a) EPC in relation to D1, novelty of the claimed subject-matter vis-à-vis D1 and D12, and inventive step of the claimed subject-matter starting from D2 as the closest prior art. Both parties basically relied on their written submissions, whereby the following aspects were particularly referred to:

(a) The appellant was of the opinion that DV-4343 disclosed in D1 was not covered by the secrecy agreement, in particular because the respondent had failed to produce a document which designated DV-4343 in writing as confidential. Paragraph 1.(a) of the secrecy agreement required such a written confirmation. The e-mail D18b could not be considered as a written confirmation since the intellectual property department was not involved in that e-mail.

The respondent, on the other hand, was of the opinion that D18b confirmed that Rheox Inc. was aware of the "confidential" monomer DV-4343. Although D1 did not disclose the exact (ie complete) formula of DV-4343, it disclosed the nature of DV-4343 in substance. However, anything relating to DV-4343 was confidential and, therefore, covered by the secrecy agreement.

(b) The appellant raised no objections under Articles 84 and 123(2) and (3) EPC against the main request.

(c) As regards novelty, the appellant emphasized its view that the monomer DV-4343 was not and could not be under any circumstances a pure tristyryl phenol monomer, since the reaction involved in the preparation of tristyryl phenol, ie a Friedel-Crafts reaction, was not selective and produced a mixture of mono-, di- and tristyryl phenol.

Furthermore, the appellant was not aware of any purification process that would yield a pure tristyryl phenol.

The respondent was of the opinion that it might well be possible to obtain pure tristyryl phenol from a Friedel-Crafts reaction mixture, eg by chromatography.

(d) The respondent did not elaborate on the novelty objection based on D12.

(e) As regards inventive step, the appellant submitted a table presenting the cited prior art documents in a chronological way in order to visualize the trend in surfactant chemistry towards styryl phenol groups as hydrophobic groups.

D25: Chronological table of cited prior art.

The appellant also pointed out that D15 confirmed the preference for styryl groups in the surfactant chemistry but admitted that D15 itself did not provide the solution.

IX. The appellant requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

X. The respondent requested that the decision under appeal be set aside and the patent be maintained

- on the basis of the main request comprising Claims 1-27 filed on 18 November 2005, or in the alternative

- on the basis of auxiliary requests 1-3 filed on 18 November 2005.

Reasons for the Decision

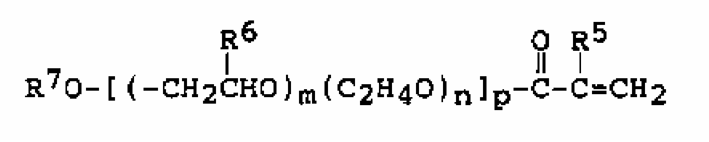
1. The appeal complies with Articles 106 and 108 EPC and Rule 64 EPC and is therefore admissible.

2. *Disclosure of D1 - Article 55(1)(a) EPC*

2.1 D1 discloses a polymeric rheological additive comprising the reaction product of

(a) about 15 to 80 percent by weight of one or more C_3-C_8 α,ß-ethylenically unsaturated carboxylic acid monomers;
(b) about 15 to 85 percent by weight of one or more copolymerizable vinyl non-ionic ethylenically unsaturated monomers; and
(c) about 0.5 to 25 percent by weight of one or more vinyl monomers containing an aralkyl substituted phenol hydrophobe.

2.1.1 According to page 5, line 36 to page 6, line 34, the monomer (c) is a non-ionic polyalkoxylated hydrophobic surfactant monomer which can be of the formula:

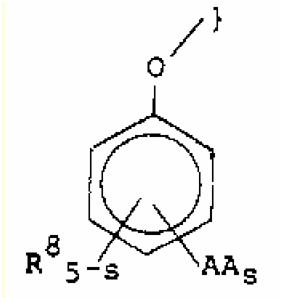


$$R^7O\text{-}[(\text{-}CH_2\overset{R^6}{\overset{|}{C}}HO)_m(C_2H_4O)_n]_p\text{-}\overset{O}{\overset{\|}{C}}\text{-}\overset{R^5}{\overset{|}{C}}{=}CH_2$$

Formula (1)

where R^5 is H or CH_3, R^6 is H or C_1-C_2 alkyl, n is an average number from about 6-100 and m is an average number from about 0-50 provided that $n \geq m$ and $\Sigma(n+m)$ is from about 6-100, and R^7 is an aralkyl substituted phenol moiety.

According to page 6, lines 10-25, R^7 can be:



Formula (2)

wherein:

R^8 is a radical bonded to the aromatic ring selected from the group consisting of hydrogen, alkyl, aryl, aralkyl, OR^6, halo, cyano, COOH, $COOR^9$, $COONH_2$ and $OCOR^9$, and where R^9 is selected from the group consisting of alkyl groups, saturated or unsaturated, having 1 to 22 carbon atoms, aryl and aralkyl,

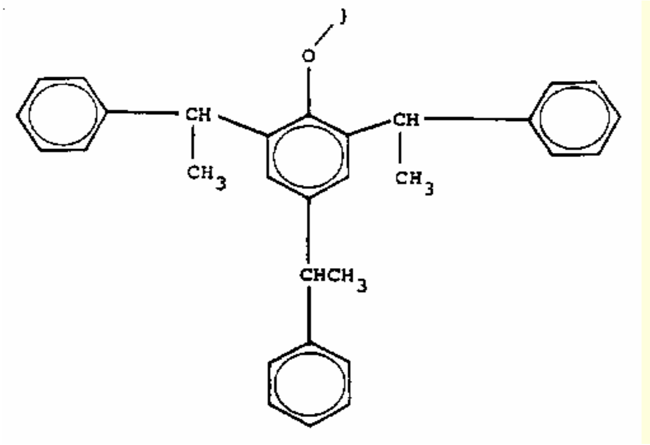
AA represents an aralkyl group of the type $[(-CR^{10}R^{11})_x Ø]$ and s is an integer from 1 to 3,

R^{10} and R^{11} for each methine carbon of the aralkyl groups are independently selected from the group consisting of H, C_1-C_{12} linear or branched alkyl, aralkyl and aryl moieties,

x is an integer from 1 to 12, and

Ø represents an aryl moiety.

2.1.2 In a preferred embodiment, the monomer (c) is DV-4343, a polyethoxylated tristyryl phenol methacrylate manufactured by Rhone-Poulenc (Example 2). This monomer contains a R^7 compound of the following formula (passage bridging pages 6 and 7):



Formula (3)

In terms of the above mentioned Formula (1) on page 5 of D1, this means that for DV-4343 R^5 is CH_3 (methacrylate), m is 0 or, if $m > 0$, R^6 is H (polyethoxylated) and R^7 is tristyryl phenol.

Thus, D1 discloses all the structural elements of DV-4343 apart from the exact number of ethylene oxide units. Since, however, DV-4343 is a polyethoxylated monomer falling within the above mentioned general Formula (1) for monomer (c), the number of ethylene oxide units in DV-4343 must be in the range from about 6-100 because if m is 0 then n = 6-100 or if $m > 0$ and $R^6 = H$ then $\Sigma(n+m) = 6\text{-}100$.

2.1.3 Consequently, D1 is highly relevant to the patent in suit since the information presented in D1 with respect to DV-4343 amounts to a novelty destroying disclosure at least for the subject-matter of Claim 1 as granted.

2.2 During the opposition and the opposition appeal proceedings, the respondent was of the opinion that D1 could not be cited against the patent in suit because it constituted a non-prejudicial disclosure within the meaning of Article 55(1)(a) EPC. With respect to the European application D1, filed on 15 September 1995 (ie within the six month period stipulated by Article 55(1) EPC), the respondent invoked the violation of a secrecy agreement (D18c) between Rhone-Poulenc Inc., the legal predecessor of the respondent, and the applicant of D1, Rheox International, Inc.

2.2.1 As is apparent from the introductory part of D18c, the secrecy agreement related to the field of rheological additives and associative thickeners and the feasibility of an advantageous commercial relationship between Rheox International, Inc (in D18c referred to as "Rheox") and Rhone-Poulenc Inc. (in D18c referred to as "Company") with respect to these additives and thickeners. As regards the subject-matter to be held in confidence, the secrecy agreement does not disclose a specific compound or a specific technology but is drafted in rather general terms. Paragraphs 1.(a) and 7 of D18c read as follows:

"1.(a) Rheox and Company each agree to hold in confidence and not to use in any commercial manner or for any commercial purpose except for exploration of a future mutual relationship, or to disclose to third parties without prior written consent of the disclosing party, any and all

> *INFORMATION received from the other subsequent to the effective date of this Agreement, and during the course of the Agreement, which is in writing and designated in writing as "Confidential" or is received visually or orally in confidence and confirmed in writing as confidential within thirty (30) days of disclosure or is a sample received from the other party with a confidentiality notice affixed (hereinafter SAMPLE(S)).*
>
> 7. *The law of the State of New Jersey shall apply to this Agreement."*

The term "INFORMATION" is defined in the introductory part of D18c as follows:

> *"… certain information, inventions, samples, writings, ideas, formulae, processes, production information, manufacturing and trade secrets and business confidences relating to certain experimental and proprietary compounds and formulations and their use(s) (hereinafter severally and collectively referred to as the "INFORMATION") …".*

2.2.2 The respondent has provided evidence that DV-4343, referred to in D1, was covered by the secrecy agreement. Thus, the declaration D18a of J.A. Shedden, Chief Patent Counsel and Assistant Secretary of Rhodia Inc. (the successor-in-interest of Rhone-Poulenc Inc.) confirms that, in the framework of the secrecy agreement, Rheox Inc. received samples from Rhone-Poulenc Inc. to be tested in the polymer formulations of Rheox Inc. Among these samples, there was the new experimental monomer DV-4343. Furthermore, it is evident from the internal memorandum D18b that Rheox Inc. not only knew the exact chemical formula of DV-4343 but also was aware of the fact that the information relating to DV-4343 was strictly confidential and was covered by the Rheox/Rhone-Poulenc secrecy agreement.

Despite this evidence, the appellant was of the opinion that DV-4343 was not covered by the secrecy agreement because the respondent had not shown that DV-4343 was designated in writing "confidential" as required in paragraph 1.(a) of the secrecy agreement. This argument is, however, not convincing because D18b proves beyond any doubt that the people from Rheox Inc. themselves were of the opinion that DV-4343 was covered by the secrecy agreement.

2.2.3 Thus, the question to be answered is whether or not the disclosure of DV-4343 in D1 qualifies as an **evident** abuse, which is the standard of reprehensibility laid down by Article 55(1)(a) EPC. As set out in T 291/97 of 8 May 2001 (point 13 of the reasons; not published in the OJ EPO), a finding of an evident abuse is a serious matter where the case must be clear cut and a doubtful case cannot be resolved in favour of the alleging party.

2.2.4 In the present case, it is conspicuous to the board that D1 does not disclose the exact formula of DV-4343 (point 2.1.2, above). Thus, it appears that Rheox Inc. at least obeyed the letter of the secrecy agreement. As to whether or not the disclosure of part of the structure of DV-4343 was in breach of the secrecy agreement or simply the result of a lack of communication between the parties remains unclear, especially since the board has not heard any argument from the respondent that the partial disclosure of DV-4343 could be interpreted as a breach of the secrecy agreement under the law of the State of New Jersey, ie the law applicable to the secrecy agreement as set out in paragraph 7 thereof (point 2.2.1, above).

In this context, it should be pointed out that Rhone-Poulenc Inc. did not take any legal action against Rheox Inc. If the secrecy agreement had been enforced by Rhone-Poulenc Inc., there would at least have been a reaction after the filing of D1, if for no other reason than to be in a position to prove that Rhone-Poulenc Inc. considered the filing of D1 to be in breach of the agreement and therefore constituted abuse under the relevant law.

2.2.5 An indication that the partial disclosure of D1 indeed is not due to an evident abuse may be found in the "filing history" of D1 itself. The first filing of the invention disclosed in D1 was done in the US priority document D22. In contrast to D1, D22 discloses on page 14 the exact formula of DV-4343, ie including the exact number of ethylene oxide units. Under the first-to-invent patent system combined with the secrecy system then in effect in the United States Patent Office, this action had no legal effect on Rhone-Poulenc obtaining, as they did, a US patent on the monomer (see declaration D23). Nor can D22 be the subject of an investigation under Article 55(1)(a) EPC since D22 was filed more than six months before the European patent application on which the patent in suit is based. However, when filing the corresponding European patent application D1 claiming the priority of D22, Rheox Inc. omitted part of the information concerning DV-4343, namely the exact number of ethylene oxide units. This procedure could suggest that Rheox Inc. considered the avoidance of disclosing the complete structure of DV-4343 to be enough to obey the secrecy agreement.

2.2.6 In view of the above, the board is of the opinion that the disclosure of DV-4343 in D1 was not due to or in consequence of any evident abuse by Rheox Inc. to the respondent or its legal predecessor. Consequently, D1 is to be taken into consideration for the application of Article 54(3) and (4) EPC.

3. *Amendments (main request)*

3.1 The claims of the main request correspond to the claims of the auxiliary request before the opposition division (point III, above), except that the last part of Claim 6 (point VII(a), above) was amended to exactly match granted Claim 6 (point I, above).

The amendment to Claim 6 is not objectionable, since it merely reintroduces the part of granted Claim 6 which has been inadvertently omitted in the opposition procedure. This amendment may even be considered necessary in view of Article 123 EPC.

3.2 Claim 1 of the main request contains the definition that "x is an average number of from 2 to <u>less than</u> 3" (amendment underlined). Thus, amended Claim 1 excludes a monomer having **only** a tristyryl phenyl group (x = 3 in the formula of Claim 1) but covers a monomer having a tristyryl phenyl group **in admixture** with a monomer having a distyryl phenyl group and/or a monomer having a monostyryl phenyl group. In other words, a "pure" monomer having only a tristyryl phenyl group, such as DV-4343 in D1, is now excluded from Claim 1.

Although the term "less than" is not disclosed in the application as originally filed, this amendment does not contravene Article 123(2) EPC because it represents an allowable disclaimer to restore novelty over prior art to be considered under Article 54(3) and (4) EPC only, namely D1 (see G 1/03 (OJ EPO 2004, 413, point 2.1 of the headnote).

3.3 Since, furthermore, no objection under Article 123(3) or Article 84 EPC arises out of the amendments, the amendments are allowable. Nor was any objection under Article 123 or Article 84 EPC raised by the appellant.

4. *Novelty (main request)*

4.1 Document D1

4.1.1 As set out in point 2.1.2, above, D1 discloses a polyethoxylated methacrylate terminated with a tristyryl phenol moiety, namely DV-4343. However, amended Claim 1 of the main request excludes a monomer where x = 3, ie a monomer where the only terminating group is the tristyryl phenol moiety. Since, furthermore, D1 does not disclose a monomer having a distyryl phenol moiety (x = 2) or any mixture of monomers with tri-, di- and monostyryl phenol moieties, the subject-matter of Claim 1 is novel over D1.

4.1.2 However, the appellant took the view that, for any skilled person reading D1, the disclosed monomer DV-4343 was not and could not be under any circumstances a pure tristyryl phenol monomer since the reaction involved in the preparation of DV-4343 could not be selective and inevitably produced a mixture of mono-, di- and tristyryl phenol. Thus, the product DV-4343 disclosed in D1 was actually a mixture as claimed in Claim 1 of the main request (ie with x being an average number of from 2 to less than 3).

4.1.3 This argumentation is not convincing for the following reasons:

Firstly, there is no disclosure in D1 itself that DV-4343 is a mixture of monomers having tri-, di- and monostyryl phenol moieties. Formula (2) of D1 describing the aralkyl substituted phenol moiety R^7 of monomer (c) in general terms (point 2.1.1, above) gives for the aralkyl groups an **integer** from 1 to 3. The use of the term "integer" does not suggest the presence of a mixture of R^7 substituents, as the use of the term "**average** number" would have done. Furthermore, Formula (3) for the tristyryl phenol moiety on page 7 of D1 given in the context of DV-4343 (point 2.1.2, above) has exactly three styryl substituents and does not suggest the presence of a mono- or distyryl phenol moiety for the monomer DV-4343. Also the word "contains" used in the context of this formula ("… *this monomer contains a* R^7 *compound of the formula* …") does not unambiguously indicate that the tristyryl phenol moiety in DV-4343 is a mixture of tri-, di- and monostyryl phenol moieties. Even if "contains" suggest a mixture of different R^7 groups, as argued by the appellant, the other groups are not disclosed. Such groups could be, as argued by the respondent) any other AA group within Formula (2).

Secondly, it has not been demonstrated that it would be impossible at all to obtain a pure tristyryl phenol, ie the starting compound for DV-4343. The board does not doubt that the Friedel-Crafts reaction involved in the preparation of tristyryl phenol is not selective and always produces a mixture of tri, di- and monostyryl phenol, but none of the documents submitted by the appellant in this context, namely D19a, D19b, D20 and D21, states that it would be impossible to purify the resulting product mixture, eg by distillation and/or chromatography, thereby obtaining a pure tristyryl phenol. Thus, it may well be that DV-4343 was obtained from pure tristyryl phenol, even if such a purification involved additional workload and costs.

Finally, it is conspicuous to the board that the other documents in the proceedings relating to polyalkyleneoxy styryl phenols also do not refer to these compounds as being mixtures. Thus, in the general formula of D13 (column 1, lines 35-50), m is 2 or 3, ie di- or tristyryl phenol. Example 1 of D13 explicitly uses tristyryl phenol. The same applies to the general formula given in D16 (page 2; m is 2 or 3) and to Example 1 of D16 which also describes the use of polyethoxylated tristyryl phenol ("*… 5 g de tri(phényl-1-éthyl)phenol éthoxylé à 16 motifs d'oxyde d'éthylène …*"). D12, an application from the appellant itself, simply refers to ethoxylated mono-, di- and tristyryl phenols. There is no mention whatsoever that these compounds only and inevitably exist as mixtures.

Hence, it has not been plausibly demonstrated that the disclosure of tristyryl phenol in D1 could not mean what it says, namely a monomer where tristyryl phenol is the only terminating group.

4.1.4 Consequently, the subject-matter of Claim 1, and, by the same token, the subject-matter of Claims 2-27 is novel over D1 (Article 54(3) and (4) EPC).

4.2 Document D12

4.2.1 The appellant also raised a novelty objection in view of D12 which was, however, not pursued during the oral proceedings.

4.2.2 D12 discloses an associative thickening copolymer comprising units of a surfactant monomer having at least one urethane function resulting from the reaction of an isocyanate with ethylenic unsaturation with a surfactant compound having a hydroxyl function which is reactive with regard to the -NCO group. Ethoxylated mono-, di- and tristyryl phenols are - *inter alia* - mentioned as suitable surfactant compounds. However, the monomers claimed or referred to in the claims of the main request do not contain urethane group(s). Therefore, the claims of the main request are novel over D12.

5. *Problem and solution*

5.1 Claim 1 of the main request is directed in general terms to a copolymerizable nonionic ethylenically unsaturated biphillic monomer which can be used in preparing stable liquid emulsion or solution polymers having low viscosity and relatively high solids content under acidic conditions. When treated with a base, these polymers become very efficient polymeric thickeners for many aqueous systems. Surprisingly, these polymers develop maximum viscosity at lower pHs than similar products presently available in the prior art (page 2, lines 33-34 of the patent specification).

5.2 D2 discloses a water-soluble or moderately water-soluble copolymer which may be crosslinked or not and its use as a rheological modifier in diverse applications, such as drilling mud, textile printing pastes, cosmetics, detergents, various other coating compositions such as paints, and as an antisedimentation and/or suspension agent for mineral or organic materials, in various areas of technology, eg plant protection (page 1, lines 16-24). In particular, the copolymer thickens aqueous compositions under low shear and confers stability to aqueous suspensions of mineral or organic materials (page 2, lines 20-28). The copolymer comprises (a) units of at least one ethylenically unsaturated monomer having at least one carboxylic acid group, (b) optionally, units of at least one ethylenically unsaturated monomer not having a carboxylic acid (eg esters of (meth)acrylic acid) and (c) units of at least one ethylenically unsaturated monomer having an oxyalkylated moiety and being terminated by a hydrophobic fatty hydrocarbon chain of at least 26 carbon atoms. A styryl phenol group as defined in Claim 1 of the main request is not mentioned in D2. In fact, all the examples demonstrating the invention of D2 use a monomer (c) where the hydrophobic group is an alkyl group. Thus, monomer (c) of D2 is a biphillic monomer like the monomer of Claim 1 of the main request and differs from the monomer of Claim 1 basically in the hydrophobic group.

Thus, D2 discloses technical effects, purpose and intended use most similar to the claimed subject-matter and is, therefore, considered to represent the closest prior art.

5.3 The comparative test in patent in suit (table bridging pages 7 and 8) demonstrates that a latex containing an emulsion polymer with tristyryl phenol ethoxylate$_{25}$ methacrylate as the biphillic monomer provides a high viscosity at low shear and has a shear thinning rheology at a pH of about 7. On the other hand, when behenyl ethoxylate$_{25}$ methacrylate (BEM), a monomer where the terminal hydrophobic group is a C_{22} hydrocarbon chain, is used as the biphillic monomer, the latex has a lower viscosity at this pH and shows no shear thinning rheology but a substantially Newtonian (non-shear thinning) rheology. Since, furthermore, the terminal hydrophobic group in BEM is structurally very closely related to the hydrophobic fatty hydrocarbon chain exemplified in D2 for monomer (c), the board accepts the results in the patent in suit as a valid comparison which establishes the superiority of the claimed subject-matter over the closest prior art with respect to improved rheology, in particular shear thinning ability at a relatively low pH.

5.4 Therefore, the objective technical problem to be solved by the claimed subject-matter has to be seen in the provision of a biphillic monomer that can be copolymerized with other monomers to provide polymeric thickening agents with improved rheology, in particular a shear thinning rheology at a relatively low pH.

In view of the comparative test in the patent in suit, the board is satisfied that the above mentioned objective technical problem is solved by monomer identified in Claim 1 of the main request.

6. *Inventive step (main request)*

6.1 It may be convenient to recall at this juncture that D1 is a document under Article 54(3) and (4) EPC and, therefore, cannot be used in the assessment of inventive step.

6.2 It remains to be decided whether the proposed solution, ie a monomer with a hydrophobic styryl phenol moiety as defined in Claim 1, is obvious from the available prior art.

6.2.1 D13 (which is identical with D17) and D16 disclose compounds based on polyoxyalkylenated di- or tristyryl phenol. However, these compounds are merely surface active agents assisting in the production of stable emulsions, ie they are not monomers that can be (co)polymerized. These documents neither relate to thickening agents nor is there any teaching about the potential influence of di- or tristyryl phenol groups upon rheological effects, let alone to a shear thinning rheology at a relatively low pH. Thus, the skilled person, trying to solve the objective technical problem, would have no motivation to replace the hydrophobic fatty hydrocarbon chain of the copolymer of D2 by the di- or tristyryl phenol groups disclosed in D13 (=D17) or D16. The mere fact that these documents disclose di- or tristyryl phenol groups is not enough to render the claimed subject-matter obvious, because in that case the combination of the closest prior art with these documents would be based on hindsight.

6.2.2 D12 is in the field of thickeners and discloses a surfactant monomer containing an urethane group and may comprise - *inter alia* - mono-, di- or tristyryl phenol as the hydrophobic group (point 4.2.2, above). There is no hint in D12 that the styryl phenol groups provide advantages with respect to pH response and rheological effects over the other hydrophobic groups mentioned in D12, such as aliphatic or cycloaliphatic alkyls, aryls or secondary amines (page 5, lines 44-47). In fact, Table 1 of D12 discloses distyryl phenol, alkyl, nonyl phenol and dialkyl amine as equally suitable hydrophobic groups for the surfactant monomer. Furthermore, D12 emphasizes the relevance of a surfactant monomer containing a urethane group for the invention described therein (page 4, lines 34-35). Hence, a skilled person reading D12 had no incentive whatsoever to choose from D12 a surfactant monomer containing hydrophobic styryl groups in the expectation of improving pH response and rheology effects of a copolymer comprising such a surfactant monomer, let alone at the same time to abandon an essential feature of the structure disclosed in D12, namely the urethane group.

6.2.3 Neither does D15 point to styryl phenol groups as suitable candidates in order to solve the posed technical problem. D15 relates to water-soluble polymers comprising at least one complex hydrophobic group. Although it stresses the importance of the steric factor of these specific complex hydrophobic groups, there is no teaching in D15 which suggests the use of styryl phenol groups in the context of pH response and/or rheological improvements.

6.2.4 Consequently, the claimed subject-matter is not obvious from the relevant documents relied upon by the appellant.

6.3 The appellant was of the opinion that a person skilled in the art trying to modify the surfactant monomer of D2 would focus on the terminal group of the surfactant monomer and not on the alkoxylated backbone because that part of the molecule had been kept for decades in surfactant monomers. Thus, the objective technical problem was to find a terminal (*in situ* bound) surfactant group better than those used in the prior art. Styryl phenol groups were the obvious choice because they represented a new trend in surfactant chemistry, as demonstrated by D12, D13, D16 and D17. A new trend was regarded as more attractive, especially because the chances of reaching an innovation were higher in that case. Furthermore, the steric factor, an important feature (as apparent from D15) also points towards styryl phenol groups.

6.3.1 However, this line of argumentation is flawed from the very start because it ignores the advantages objectively achieved by the claimed subject-matter over the closest prior art thereby avoiding the formulation of an **objective** technical problem based on these advantages as required by the problem/solution approach, ie the approach consistently used in the EPO for the assessment of inventive step. Apart from referring to a new "trend" in surfactant chemistry, the appellant does not point to any document which hints at the superiority of styryl phenol groups compared to the groups used in D2, especially in relation to pH response and rheological effects. The appellant's line of argumentation is, in the board's view, based on an *ex post facto* analysis.

6.3.2 Quite apart from that, there is no convincing evidence on file for a "trend" in the surfactant domain pointing towards styryl phenol groups. Amongst the documents cited by the appellant, there are only two documents focussing on styryl phenol groups, namely D13 (=D17) and D16, whereas D12 discloses styryl phenol groups as being equivalent to alkyl, aryl or secondary amine groups.

6.3.3 Neither does D15 confirm the choice of styryl phenol groups, as pointed out in point 6.2.3, above.

6.4 In summary, the solution to the stated problem does not arise in an obvious manner from the state of the art. Consequently, the subject-matter of Claim 1 of the main request, and by the same token, the subject-matter of Claims 2-27 involves an inventive step.

7. Because the respondent succeeded on the main request, there was no need to consider the auxiliary requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the main request comprising Claims 1 to 27 as filed on 18 November 2005 and after consequential amendment of the description, if necessary.

The Registrar: The Chairman:

E. Görgmaier R. Young