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D E C I S I O N
of 12 January 2006

Case Number: T 0452/04 - 3.3.03

Application Number: 95924286.8

Publication Number: 0742799

IPC: C08F 210/16

Language of the proceedings: EN

Title of invention:
Ethylene copolymers

Patentee:
Basell Technology Company B.V.

Opponent:
BOREALIS A/S
ExxonMobil Chemical Patents Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 107
EPC R. 65(1)

Keyword:
"Admissibility of the appeal by the Patentee (no)"
"Sufficiency of disclosure (yes)"
"Novelty (yes)"
"Inventive step (no) - non functional feature"

Decisions cited:
J 0008/81, T 0016/87, T 0256/87, T 0182/89, T 0595/90, T 0225/93, T 0158/98, T 0943/00

Catchword:
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Case Number: T 0452/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 12 January 2006

Appellant: (Opponent I)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office dated 14 January 2004 and posted 2 February 2004 concerning maintenance of European patent No. 0742799 in amended form.**

Composition of the Board:

Chairman: R. Young
Members: C. Idez
C. Heath

Summary of Facts and Submissions

I. The grant of the European patent No. 0 742 799 in the name of Montell Technology Company B.V (later Basell Technology Company B.V) in respect of European patent application No. 95 924 286.8, filed on 19 June 1995 and claiming priority of an IT patent application MI941279 filed on 20 June 1994 was announced on 19 August 1998 (Bulletin 1998/34) on the basis of 6 claims.

Independent Claims 1 and 6 read as follows:

"1. Ethylene copolymer with at least one comonomer selected from:
(a) α-olefins of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having 1 to 20 carbon atoms,
(b) cycloolefins and
(c) polyenes,
with a content of ethylene units of between 80 and 99 mol %, a content of units derived from α-olefin, cycloolefin and/or polyene comonomers of between 1 and 20 mol %, characterized in that:
(a) in TREF (Temperature Rising Elution Fractionation) analysis, a quantity equal to at least 90% by weight of the copolymer is eluted in a temperature interval of less than 50°C, and
(b) Mw/Mn > 3, where Mw is the weight-average molecular weight and Mn is the number-average molecular weight, both determined by GPC.

6. Ethylene copolymer with 1-butene with a content of units derived from 1-butene of between 1 and 20 mol %, characterized in that:

(a) the percentage by weight of 1-butene (%B), determined by ^{13}C-NMR analysis, and the density (D) of the copolymer satisfy the following relationship:

$$\%B + 285\ D \leq 272$$

(b) Mw/Mn > 3, where Mw is the weight-average molecular weight and Mn is the number-average molecular weight, both determined by GPC."

Claims 2 to 5 were dependent claims.

II. Two notices of Opposition were filed against the patent, as follows:

(i) by Borealis A/S (Opponent I), on 18 May 1999, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC), and

(ii) by Exxon Chemical Patents Inc. (later ExxonMobil Chemical Patents Inc.) (Opponent II), on 19 May 1999, on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC), and of lack of sufficiency of disclosure (Article 100(b) EPC).

The objections were supported *inter alia* by the following documents:

D1: EP-A-0 447 035;
D2: EP-A-0 569 249;
D5: W0-A-93/03093;
D7: W0-A-93/09148;
D8: EP-A-0 436 399; as well as the late filed but admitted document

D15: L. Wild et al; "Determination of Branching Distribution in Polyethylene and Ethylene Copolymers"; J. Polymer Science: Polymer Physics Edition, Vol. 20 (1982), pages 441-455.

III. By a decision announced orally on 14 January 2004, and issued in writing on 2 February 2004, the Opposition Division held that the grounds of opposition did not prejudice the maintenance of the patent in amended form.

The decision was based on the main request of the Patent Proprietor consisting of a set of 5 claims filed during the oral proceedings of 14 January 2004.

Claim 1 of the main request read as follows:

"1. Ethylene copolymer with one comonomer selected from:
α-olefins of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having 1 to 20 carbon atoms,
with a content of ethylene units of between 80 and 99 mol %, a content of units derived from α-olefin comonomer of between 1 and 20 mol %, characterized in that:
(a) in TREF (Temperature Rising Elution Fractionation) analysis, a quantity equal to at least 90% by weight of the copolymer is eluted in a temperature interval of less than 50°C, and
(b) Mw/Mn > 3, where Mw is the weight-average molecular weight and Mn is the number-average molecular weight, both determined by GPC."

Dependent Claims 2 to 5 corresponded to Claims 2 to 5 as granted.

Concerning Article 100(b) EPC, the decision stated that the following objections had been made by the Opponents:

(a) Without undue effort it was not possible to obtain a copolymer according to the invention where R is an alkyl having a high number of carbon atoms (e.g. 20). The examples of the patent in suit only supported copolymers of ethylene and 1-butene and ethylene and 1-hexene.

(b) Without undue effort it was not possible to obtain a copolymer according to the invention where Mw/Mn was much higher than 3.

(c) It was not clear from the description whether the 90% of the TREF parameter of Claim 1 was directed to the total of the copolymer in question or to the crystalline part of the copolymer in question; and

(d) It was not clear from the description which solvent was to be used when determining the TREF curve for the TREF parameter of Claim 1.

Concerning objections (a) and (b), the Opposition Division accepted that a person skilled in the art could work the invention over the whole range claimed without undue effort.

Concerning objections (c) and (d), the Opposition Division considered that they were based on the fact that according to the Opponents a person skilled in the art would not know how to measure the TREF parameter of

Claim 1 and therefore would not know whether an ethylene copolymer was inside or outside the present invention. According to the Opposition Division it was clear that a person skilled in the art received clear and unambiguous instructions in the patent in suit how to determine the TREF parameter of Claim 1 (cf. page 8, lines 9 to 16).

Thus, the Opposition Division came to the conclusion that the Main Request complied with the requirements of Article 83 EPC.

According to the decision, the Opponents did not raise objections under Articles 84, 123(2) and (3) EPC against the main request.

The decision further held that the Opponents did not indicate a document disclosing an ethylene copolymer according to Claim 1 of the main request. Thus, the subject-matter of the claims was considered as novel.

Concerning inventive step, document D2 was considered as the closest state of the art.

Starting from D2, the objective problem was seen in the provision of an ethylene copolymer with one comonomer selected from alpha-olefins of the formula CH_2=CH-CH_2R, where R was hydrogen or a linear, branched or cyclic alkyl radical having 1 to 20 carbon atoms as the only comonomer with a content of ethylene units of between 80 and 99 mol %, and a content of units derived from alpha-olefin comonomer of between 1 and 20 mol %, and having a higher uniformity of comonomer distribution and a Mw/Mn > 3.

According to the decision, this problem was solved by the patent in suit which taught to prepare an ethylene copolymer with one comonomer selected from alpha-olefins of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having 1 to 20 carbon atoms as the only comonomer with a content of ethylene units of between 80 and 99 mol %, a content of units derived from alpha-olefin comonomer of between 1 and 20 mol %, characterized in that
(a) in TREF (done in the way described in the lines 9 to 16 of page 8 of the patent in suit), a quantity equal to at least 90% by weight of the total of the copolymer was eluted in a temperature interval of less than 50°C, and in that the copolymer had a Mw/Mn > 3.

According to the decision, the other cited documents did not mention ethylene copolymers having such a high uniformity of comonomer distribution that in TREF a quantity equal to at least 90% by weight of the total of the copolymer in a temperature interval of less than 50°C. Therefore these other documents could not suggest a way of improving the ethylene copolymers of D2 in such a way that the now claimed ethylene copolymer was obtained.

Thus, the Opposition Division came to the conclusion that the subject-matter of the claims of the main request was also inventive.

IV. Notices of Appeal were filed with simultaneous payment of the prescribed fees on 1 April 2004 by Opponent II, on 2 April 2004 by Opponent I, and on 7 April 2004 by the Patentee.

V. With the Statement of Grounds of Appeal filed on 28 May 2004, Opponent I submitted the following documents:

D20: Repetition of Example 2 of document D2;
D21: Repetition of Example 1 of document D1; and
D22: R.A.V Raff et all "Crystalline olefin polymers"; Part I, Interscience Publishers, 1965; pages 680-683.

It argued essentially as follows:

(i) Concerning the appeal filed by the Patentee:

(i.1) The patent had been maintained on the basis of the main request of the Patentee.

(i.2) It was thus not adversely affected by the decision of the Opposition Division.

(ii) Concerning Article 100(b) EPC:

(ii.1) Ethylene copolymers might have an amorphous content of up to 40%.

(ii.2) As shown by D22 (page 681) low pressure polyethylene had a crystallinity of 60 to 90%.

(ii.3) According to Claim 1 of the patent in suit as maintained, the TREF was based on the entire copolymer.

(ii.4) However, in the patent in suit (cf. Table 2) the TREF values were based on the crystalline part.

(ii.5) The Patentee had confirmed (cf. letter of 3 March 2000, page 4) that the TREF detected only substantially crystalline polymers.

(ii.6) The patent in suit disclosed only TREF values in relation to the crystalline part of the copolymer. It did not teach how the TREF values of the entire copolymer should be determined. It lacked sufficiency in respect of the disclosure of this crucial parameter.

(ii.7) Furthermore, if the amorphous content was greater than 10% it would be impossible to elute more than 90% of the copolymer in a temperature interval less than 50°C.

(ii.8) Since the amorphous part of ethylene copolymers was in the range from 10 to 40% the TREF values as defined in the patent could not be measured.

(ii.9) There was no disclosure in the patent in suit of how to meet the requirements in terms of TREF values for a molecular weight distribution greater than 6.4.

(ii.10) The examples of the patent in suit only disclosed copolymers with 1-butene and 1-hexene. Claim 1 was however directed to copolymers having up to 23 carbon atoms.

(ii.11) Thus, the patent lacked sufficiency to be worked across the breath claimed.

(iii) Novelty:

(iii.1) The patent in suit referred to measurements using TREF. This implied that only the crystalline part of the copolymer was measured.

(iii.2) Example 1 of 1 of D1 had been reworked using 1-hexene instead of 4-methyl-1-pentene.

(iii.3) While this was a variation of the actual example of D1, when considering novelty, a document must be read as a whole and not in isolation of a single example.

(iii.4) The copolymer obtained showed an ethylene content of 95.8 mole %, a hexene content of 4.2 mole%, and a Mw/Mn of 4.2. The TREF analysis showed that 90% of the copolymer was eluted within an interval of 40°C.

(iii.5) Thus, Claim 1 lacked novelty in view of D1.

(iii.6) Example 2 of D2 (see also repetition thereof in D20) was also novelty destroying for the subject-matter of Claim 1, since the TREF value was 94.4% in the range 50°C to 100°C.

(iv) Inventive step:

(iv.1) The aim of the patent in suit was to provide ethylene copolymers with a uniform comonomer distribution and wide molecular weight distribution.

(iv.2) A uniform comonomer distribution gave copolymers with low degrees of crystallinity and low density. A wide molecular weight distribution was known to give improved processability.

(iv.3) D2 belonged to the same field as the patent in suit. It noted that it was preferable to have a narrow composition distribution but not a narrow molecular weight distribution.

(iv.4) Thus, it could be inferred from D2 that the ideal polymer would be one with a narrow comonomer distribution combined with a wide molecular weight distribution. Consequently, the solution to the presently claimed invention had already been disclosed.

(iv.5) Hence, the skilled person having obtained a copolymer with a narrow commoner distribution would seek to broaden the molecular weight distribution (reference was made in that respect to the decision T 595/90 (OJ EPO 1994, 695)). Thus, there was nothing inventive in what the Patentee had done.

(iv.6) D2 and the patent in suit disclosed that highly uniform polymers were known and that they could be obtained using metallocene catalysts. Both stated that in order to get a good processability, the molecular weight distribution should be broadened. Both showed polymers having good uniformity and broad molecular weight distribution.

(iv.7) The only difference between the patent in suit and D2 was in the way of expressing the uniformity.

(iv.8) In D2 it was expressed by the showing that no polymer would be eluted outside a particular range, while in the patent in suit this was expressed by

showing that all the polymer was eluted in a particular range.

(iv.9) This difference was not relevant for inventive step. What was relevant was whether the skilled person would seek to produce a polymer with a narrow monomer distribution and a broad molecular weight distribution. Such a solution was clearly already disclosed in D2.

(iv.10) D7 related to olefin polymers having broadened molecular weight distribution.

(iv.11) D7 made use of a metallocene catalyst (as in D2 and in the patent in suit) to produce polymers with good uniformity.

(iv.12) D7 thus disclosed the benefits of a good uniformity and broad molecular weight distribution.

(iv.13) Thus the patent in suit lacked inventive step in view of D2 and D7.

(iv.14) The aim of D8 was to provide olefin polymers which were well balanced between broad molecular weight distribution and narrow composition distribution.

(iv.15) Thus, the patent in suit lacked inventive step in view of the combination of D2 and D8.

(iv.16) Example 4 of D5 disclosed all the features of the claimed invention except the TREF values. However, the composition obtained in that example would inherently have a narrow composition distribution.

Thus, there was nothing inventive about the claimed subject-matter.

VI. In the Statement of Grounds submitted on 28 May 2004, Opponent II argued essentially as follows:

(i) Concerning the appeal filed by the Patentee:

(i.1) The Patentee was not adversely affected by the decision and could not appeal.

(i.2) Thus, the appeal of the Patentee was not admissible.

(ii) Construction of the claims:

(ii.1) In its decision the Opposition Division took the view that the claims should be construed as placing the following requirements on the TREF analysis:

(A) the TREF was carried out in the way described on page 8, lines 9 to 16, which had the effect of limiting to the use of o-xylene as solvent, and

(B) the quantity of copolymer eluted in a temperature interval of less than 50°C was to be calculated on the total copolymer including the amorphous part which was not eluted as being soluble at 10°C.

(ii.2) This construction was however incorrect and inconsistent with the granted patent.

(ii.3) The patent in suit discussed the TREF analysis on page 3, lines 14 to 29 by reference to document D15.

(ii.4) Thus the skilled reader would conclude that guidance as to carry out the analytical TREF procedure was to be found in that document.

(ii.5) D15 disclosed an analytical TREF method using 1,2,4-trichlorobenzene as solvent (TCB). While D15 mentioned the use of xylene this was not in the context of the method of Wild.

(ii.6) In the examples of the patent in suit a specific TREF technique with xylene as solvent was used (page 8, lines 9-16), but it was indicated that the examples were not limiting.

(ii.7) Thus, the skilled reader could only conclude that the method described on page 8, lines 9-16 was an alternative acceptable method, that a variety of TREF methods could be used, and that the solvent (TCB or xylene) was not critical.

(ii.8) Thus, a proper construction of Claim 1 would not import the limitation A indicated above.

(ii.9) The skilled person did not know whether or not the material soluble at room temperature (i.e. the amorphous part) should be included in the calculation of the percentage of copolymer eluted in a temperature range.

(ii.10) D15 cited in the patent in suit clearly showed only the crystallisable portion of the TREF curve.

(ii.11) As shown by Annexe 1 of the submissions of the Opponent II dated 14 November 2003, the TREF results of Example 9 of the patent in suit must have been calculated on the polymer eluted.

(ii.12) Thus, Limitation B was not disclosed in the patent, and was inconsistent with the reference to Wild in the disclosure and with the results reported in the examples.

(ii.13) Consequently, Claim 1 should be construed as referring to an:
Ethylene copolymer with one comonomer selected from: alpha-olefins of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having from 1 to 20 carbon atoms, with a content of ethylene units of between 80 and 99 mole%, a content of units derived from alpha-olefin comonomer of between 1 and 20% in mole characterised in that
in TREF analysis using a solvent such as TCB or xylene, a quantity equal to at least 90% by weight of the copolymer subjected to fractionation, and thus excluding amorphous material, is eluted in a temperature interval of less than 50°C; and in that it exhibits a Mw/Mn > 3.

(iii) Article 100(b) EPC:

(iii.1) Claim 1 as correctly construed did not specify the solvent to be used in the TREF determination.

(iii.2) The Patentee in its submissions of 27 March 2001 (section 4) had stated that it was well known in the art that TREF analysis was very sensitive to the

conditions in which it was carried out, particularly to the solvent used.

(iii.3) Furthermore, the Patentee (cf. paragraph 2.1 of the submission dated 25 November 2002 had criticised Opponent I for using TCB in TREF measurements.

(iii.4) However the patent did not say that TCB could not be used.

(iii.5) Thus, the skilled reader did not know when he was working in the forbidden area of the claims. Reference was made to the decision T 256/87 of 26 July 1988 (not published in OJ EPO) in that respect.

(iii.6) Furthermore, if two different methods might be used (in this case, TCB or xylene as solvent) which did not lead to the same results, the skilled reader was faced with an undue burden and the patent insufficiently described the invention. Reference was made to decision T 225/93 of 13 May 1997 (not published in OJ EPO).

(iii.7) The ethylene copolymers of claim 1 were formed from alpha olefins of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having from 1 to 20 carbon atoms.

(iii.8) The examples of the granted patent were limited to butene and hexene as comonomers.

(iii.9) It was not credible that the compositional uniformity and molecular weight distribution

characteristics of the invention could be obtained over the whole range of the claim.

(iv) Novelty

(iv.1) Provided Claim 1 would be construed as submitted by Opponent II, D2 would be novelty destroying since Example 2 disclosed:

an ethylene-butene-1 copolymer having 3.5 mol% butene-1, a Mw/Mn of 3.7 by GPC,
and a TREF value of 94,39% of the eluted polymer.

(v) Inventive step:

(v.1) The aim of the patent was to improve the processability of metallocene catalysed copolymers that have an extremely uniform distribution of the comonomer units, particularly for film applications (granted patent page 2, lines 26-28).

(v.2) Documents D2, D7 and D8 addressed the same problem.

(v.3) The solution according to the granted patent was to have a broader molecular weight distribution (page 2, lines 47-48).

(v.4) This was also disclosed in the prior art documents such as D2.

(v.5) D2 would represent the closest state of the art.

(v.6) If it would be considered that the TREF feature was not anticipated by Example 2 of D2, this feature did not relate to the solution of the problem.

(v.7) The TREF analysis was only a different method of characterising the uniform distribution of the prior art. Thus, it could not confer inventive step.

(v.8) Figures 1 and 3 of the patent in suit showed a less uniform distribution than D2, since both curves showed material eluted above 90°C and below 25°C.

(v.9) D2 also achieved low density with smaller amounts of butene than the patent in suit.

(v.10) Examples 1-5 of D2 all had a Mw/Mn greater than 3.7. They would have the benefit of improved processability.

(v.11) Thus, it was not possible to define a problem relative to D2 that was solved by the copolymers of the patent in suit.

(v.12) Thus, there was no inventive step in the claimed copolymers.

(v.13) In its letter dated 3 March 2000 (paragraph bridging pages 9 and 10), the Patentee had stated that the technical problem was unexpectedly solved according to the present invention by conducting the polymerisation reaction in the presence of a specific catalyst. However, that was not what was claimed.

VII. With the Statement of Grounds of Appeal submitted filed on 3 June 2004, the Patentee filed a new main request and two auxiliary requests. It also submitted arguments concerning the sufficiency of disclosure, the novelty and inventive step of these requests.

VIII. In its letter dated 5 October 2004, the Patentee presented its comments on the arguments of the Opponents set out in their respective Statement of Grounds of Appeal. It argued essentially as follows:

(i) Concerning the sufficiency of disclosure:

(i.1) Opponent I had stated that if the copolymers contained more than 10% of amorphous material, the definition of claim was meaningless because it would be impossible to elute a quantity equal to at least 90% of the copolymer in a temperature interval of less than 50°C.

(i.2) This argument was meaningless. If it were not possible to elute a quantity equal to at least 90% of the copolymer in a temperature interval of less than 50°C, the copolymer would not be comprised in the subject-matter covered by the patent.

(ii) Concerning novelty:

(ii.1) In its repetition of Example 1 of D1, Opponent I had changed the comonomer.

(ii.2) Concerning Example 2 of D2, it was clear from the wording of Claim 1 of the patent in suit that the

percentage of copolymer eluted was calculated on the ethylene copolymer and not its crystalline fraction.

(iii) Concerning inventive step:

(iii.1) D2 had been considered as relevant for inventive step.

(iii.2) D2 disclosed copolymers which, although having a wide molecular weight distribution, did not possess the uniform monomer distribution feature of the claimed copolymers, as shown by the repetition of the Example 2 carried out by the Patentee.

(iii.3) Starting from D2 the person skilled in the art did not find any suggestion about how to improve the uniform comonomer distribution so that to achieve the invention claimed in the opposed patent.

(iii.4) D7, D8 and D5 did not teach how to improve the comonomer distribution of the copolymer described in D2.

IX. In its letter dated 7 December 2004, Opponent I argued essentially as follows:

(i) Admissibility of the appeal of the patent proprietor:

(i.1) Since the Patentee was not adversely affected by the decision of the Opposition Division, its appeal was inadmissible. The Patent Proprietor should be regarded as a party to the appeal proceedings as of right.

(i.2) Thus, the Patent Proprietor was not entitled to broaden the scope of protection of claim 1 under the principle of reformatio in peius.

(i.3) Hence, it should not be allowed to defend the patent in the form of the requests filed with its letter dated 3 June 2004.

(ii) Interpretation of the claims and novelty:

(ii.1) The Patentee had submitted that a copolymer, having an amorphous part of more than 10%, would not fall under Claim 1.

(ii.2) This statement contradicted the own patent description, namely Example 9 on page 16, Table 2 as well as Figure 2.

(ii.3) It was obvious from Example 9 in Table 2 that the TREF value measured in that table only related to the crystalline part of the polymer. Otherwise, a value of "Δ°C/90 % polymer" could never be reached.

(ii.4) It was accurate to construe the content of the claims in the light of the description, and not, as suggested by the patentee, in a strict sense of the wording of the patent claim.

(ii.5) Hence, claim 1 should be read in a way that "copolymer" meant the crystalline part of the same, only.

(ii.6) Thus, claim 1 of the main request lacked novelty over D2.

X. With its letter dated 23 November 2005, Opponent I informed the Board that it would not attend the oral proceedings scheduled to take place on 12 January 2006.

XI. In its letter dated 9 December 2005, Opponent II relied essentially on the arguments presented in its previous submission.

XII. Oral proceedings before the Board were held on 12 January 2006 in the absence of Opponent I.

(i) The first issue considered at the oral proceedings concerned the admissibility of the appeal filed by the Patentee. In that respect, while Opponent II essentially relied on its arguments submitted in the course of the written phase of the appeal proceedings, the Patentee argued essentially as follows:

(i.1) It was clear from the minutes of the oral proceedings (page 5, lines 20-23) before the Opposition Division that the Opposition Division had *de facto* taken a decision concerning the main request of the Patentee submitted with its letter dated 25 November 2002. Reference was made to the decision J 08/81 (OJ EPO, 1982, 010).

(i.2) Thus, the further requests submitted by the Patentee in the course of the oral proceedings before the Opposition Division represented auxiliary requests.

(i.3) Consequently, the decision of maintaining the patent in amended form issued was based on an auxiliary

request of the Patentee. The Patentee was hence adversely affected by this decision.

(ii) The Board, after deliberation, having informed the Parties that the appeal filed by the Patentee was considered as inadmissible, that consequently, the Patentee was the Respondent in view of the appeals filed by Opponents I and II, and that therefore it was primarily restricted to defending the patent as thus maintained, the Patentee indicated that it withdrew its requests submitted with its letter dated 3 June 2004, and that it requested that the appeals of the Opponents I and II be dismissed.

(iii) The discussion then moved to the questions of (a) sufficiency of disclosure, (b) novelty, and (c) inventive step. While the Parties essentially relied on their submissions made during the written phase of the appeal proceedings, the Parties made the additional submissions which may be summarized as follows:

(iii.a) Concerning the sufficiency of disclosure:

(iii.a.1) By Opponent II:

(iii.a.1.1) There was no indication in the patent in suit of the criticality of the use of xylene as solvent for carrying out the TREF determination.

(iii.a.1.2) From Figure 2 of the patent in suit which referred to the TREF analysis of Example 9 thereof, it was evident that no 60°C temperature interval could be found corresponding to the elution of 90% of the whole copolymer, since, in view of the solubility in xylene

at 25°C indicated in Table 2 for this copolymer, 15.8% thereof would have been eluted below 25°C. Furthermore no spike corresponding to the amorphous portion of the copolymer of Example 9 was apparent on the left side of the TREF analysis on Fig.2.

(iii.a.1.3) In the amorphous fraction, copolymers with an amount of comonomer outside the claimed range of 1 to 20% would be present and could not be taken into consideration when calculating the percentage of copolymer eluted in a 50°C range.

(iii.a.1.4) These points made evident that the calculation of the relative amount of copolymer eluted could be based only on the crystalline fraction of the copolymer.

(iii.a.2) By the Patentee:

(iii.a.2.1) The only method disclosed and used in the patent in suit for the determination of the TREF was the method disclosed on page 8, lines 9 to 16 of the patent in suit.

(iii.a.2.2) The passage at page 3, lines 23 to 25 referring to document D15 represented a general presentation of TREF analysis.

(iii.a.2.3) The method detailed on page 9 was disclosed in the paragraph "Characterizations" (cf. page 7, line 35 to page 9, line 16)) which dealt with the analytical methods for the determination of properties of the claimed copolymers (i.e. density, comonomer

content, melt indices, melting point, solubility in xylene and TREF).

(iii.a.2.4) These determinations were in no way restricted to the copolymers disclosed in the examples. The Examples were disclosed under the heading "Polymerizations" (page 11, line 30 to page 14, line 49).

(iii.a.2.5) Thus, it would have been clear for the person skilled in art that the method to be used for determining the TREF was the method disclosed at page 9, lines 9 to 16 of the patent in suit, using xylene as solvent.

(iii.a.2.6) From the wording of Claim 1, it was clear that it was the total copolymer which constituted the basis for the calculation of the amount eluted in TREF.

(iii.a.2.7) The reference made by the Opponent II to Example 9 was not significant, since the solubility in xylene indicated in Table 2 was determined at 25°C while the TREF analysis started at 10°C. Thus, a part of the soluble portion would be detected in the TREF.

(iii.a.2.8) Furthermore, it was not possible to conclude that the part soluble in xylene at 25°C according to the method disclosed on page 8, lines 4 to 8, would inevitably correspond to the portion soluble in xylene below 25°C in the conditions of the TREF analysis. Figure 2 was only a schematic representation of the TREF analysis of Example 9 and there was no obligation on the Patentee to reproduce in the patent in suit the exact diagram of the TREF analysis.

(iii.b) Concerning novelty:

(iii.b.1) By Opponent II: Provided the amount of eluted copolymer would be based on the crystalline part of the copolymer, Example 2 of D2 would be novelty destroying for the subject-matter of Claim 1 of the patent as maintained by the Opposition Division.

(iii.b.2) By the Patentee: The repetition of Example 2 of D2 by the Patentee had shown that the copolymer of that example did not meet the requirements in terms of TREF set out in Claim 1 of the patent as maintained by the Opposition Division.

(iii.c) Concerning inventive step:

(iii.c.1) By Opponent II:

(iii.c.1.1) The copolymer of Example of D2 exhibited a narrower comonomer distribution than the copolymers according to the patent in suit since 100% of the copolymer eluted in TREF in a temperature range of only 65°C, while the copolymers according to the patent in suit eluted in a temperature range of greater than 70°C.

(iii.c.1.2) The fact that the comonomer distribution was not narrower for the copolymers according to the patent in suit was illustrated by the fact that the density of the copolymer of D2 was lower than that of the copolymer of the patent in suit having an even higher comonomer content (Example 6).

(iii.c.1.3) The patent in suit disclosed no mechanical properties of the claimed copolymers.

(iii.c.1.4) There was no indication of a link between a better processability and the specific TREF requirements, whether in terms of melt temperature or in terms of melt index.

(iii.c.1.5) The TREF feature only represented a different way of characterizing the comonomer distribution. This feature was not associated with a technical effect. It could not confer inventive step.

(iii.c.1.6) The statement in the paragraph bridging pages 2 and 3 of the patent in suit referred to the process for the manufacture of the copolymers using a specific catalyst. Even if the process was novel, this could not confer inventive step to the products obtained.

(iii.c.2) By the Patentee:

(iii.c.2.1) It had been shown that the copolymer of Example 2 did not meet the requirements in terms of TREF.

(iii.c.2.2) The copolymers according to the patent in suit exhibited hence a more homogeneous comonomer distribution.

(iii.c.2.3) It was not clear whether the copolymers of D2 were obtained using metallocene catalysts. The catalysts used in the patent in suit led to a better TREF, i.e. to a better comonomer distribution.

(iii.c.2.4) It was a desideratum to obtain copolymers with a more uniform comonomer distribution. This was fulfilled by the copolymers according to the patent in suit exhibiting the specific TREF values.

(iii.c.2.5) As indicated on page 2, lines 15 to 21 of the patent in suit, the claimed copolymers exhibited improved properties due to their more uniform comonomer distribution. This was in particular a better processability as reflected by their lower melting point.

XIII. The Patentee requested that the decision under appeal be set aside and the patent be granted on the basis of the main request with claims 1-5 as filed on 3 June 2004, alternatively on the basis of auxiliary requests 1 or 2 as filed on 3 June 2004. In the alternative, the Patentee requests the opponents' appeal to be dismissed.

The Opponents requested that the Patentee's appeal be rejected as inadmissible and that the patent in suit be revoked.

Reasons for the Decision

Procedural matters

1. As mentioned above in paragraph X, Opponent I informed the Board with its letter dated 23 November 2005 that it would not be represented at the oral proceedings. In accordance with Rule 71(2)EPC, the proceedings were continued without Opponent I.

2. The appeals filed by the Opponents I and II are admissible.

3. *Admissibility of the appeal filed by the Patentee*

3.1 According to Article 107 EPC, any party to proceedings adversely affected by a decision may appeal. It thus follows that the Board has to decide whether the Patentee was adversely affected by the appealed decision within the meaning of that provision as interpreted by the jurisprudence of the boards of appeal.

3.2 In that context, the Board firstly notes that point 16. of the section Facts and Submissions of the decision of the Opposition Division clearly states that "During the oral proceedings the Proprietor replaced the pending requests by a new Main Request and 3 Auxiliary Requests". As further indicated in that paragraph a copy of the claims of the **Main Request** was given in Annex 2 to the decision (emphasis by the Board).

3.3 In this connection the Board further observes that this request was unambiguously labelled as "MAIN REQUEST" and signed as such by the Representative of the Patentee at the oral proceedings (cf. Annex 2 to the decision).

3.4 The Board also notes that point 7 of the Reasons for the Decision of the decision under appeal of unambiguously states that the grounds for opposition raised by the Opponents "do not prejudice the maintenance of the patent EP-B-0 742 799 in the amended

form of the pending **Main Request**" (emphasis by the Board).

3.5 In that respect, there can also be no doubt in view of the following sentence on page 6 of the minutes of the oral proceedings "The Proprietor filed a new set of requests: a main and three auxiliary requests (Annex 3)", that the "pending main request" is the first set of claims of Annex 3 to the minutes of the oral proceedings, which is labelled as "MAIN REQUEST" and signed as such by the Representative of the Patentee. This is further corroborated by the fact that this set of claims exactly corresponds to the set of claims of Annex 2 to the decision of the Opposition Division.

3.6 The Board further observes that the Patentee in the written phase of the appeal proceedings neither alleged that the minutes of the oral proceedings were wrong nor requested them to be corrected and that the Patentee had not contested the statements made under the points 7. and 16. mentioned above of the decision under appeal.

3.7 Thus, under these circumstances the Board can only come to the conclusion that the decision of the opposition division to maintain the patent in amended form was indeed based on the main request according to Annex 2 to the decision submitted by the Patent Proprietor at the oral proceedings before the Opposition Division.

3.8 This conclusion cannot be altered by the submissions of the Patentee made at the oral proceedings before the Board that the Opposition Division had taken a decision to reject the main request of the Patentee as filed with its letter dated 25 November 2002, and that,

consequently, the further requests submitted by the Patentee at this oral proceedings should be hence considered as auxiliary requests.

3.8.1 While in the case forming the subject of the decision J 08/81 referred to by the Patentee at the oral proceedings before the Board, it was considered that a communication of the Receiving Section constituted a clear rejection of the Appellant's request, the Board is unable, in the present case, to find in the minutes of the oral proceedings before the Opposition Division a clear and reasoned rejection of the main request of the Patent Proprietor as filed with its letter dated 25 November 2002.

3.8.2 On the contrary, as it appears from page 5 of the minutes of the oral proceedings, the Opposition Division merely informed the Patentee on its views concerning the issues under Article 100(b) EPC in respect this main request, and it then invited the Patent Proprietor to file new requests.

3.8.3 As it further appears from the minutes of the oral proceedings (page 5) the Patentee, having then been invited by the Opposition Division to file new requests, filed amended **main** and auxiliary requests (cf. Annex 1 to the minutes of the oral proceedings) which were subsequently amended (cf. Annex 2) and finally replaced by a new set of requests comprising a **main** and the auxiliary requests (cf. Annex 3 to the minutes of the oral proceedings), so that there can be no doubt that it was the Patentee, which decided on its own to abandon the main request filed with its letter dated 25 November 2002.

3.9 Since the decision which the Patentee now appeals was to maintain the patent in suit on the basis of its main request, it must be considered that the decision effectively granted the Patentee's request in full.

3.10 Thus, it follows from the above that the Patentee was not adversely affected by the decision under appeal within the meaning of Article 107 EPC.

3.11 Consequently, the appeal of the Patentee does not comply with Article 107 EPC, and it has to be rejected as inadmissible in accordance with Rule 65(1) EPC.

4. *Wording of the claims*

4.1 *As* indicated above in Section XII (ii), the Patentee withdrew its requests submitted with its letter of 3 June 2004.

4.2 Thus, the only set of claims under consideration is the set of Claims 1 to 5 on which the Opposition Division decided to maintain the patent.

4.3 This set of Claims has been considered as meeting the requirements of Article 84, 123(2) and 123(3) EPC by the Opposition Division. No objections have been raised by the Opponents against these claims in that respect (cf. Section III above), and the Board is also satisfied that the requirements of these articles are met by all the claims.

5. *Sufficiency of disclosure*

5.1 Lack of sufficiency has been alleged by the Opponents on the grounds:

(i) that the patent lacks sufficient teaching for the invention to be worked across the breadth claimed, i.e.

(i.1) for obtaining copolymers meeting the TREF requirement and having a molecular weight distribution higher than 6.4; and

(i.2) for obtaining copolymers in which the comonomer could contain up to 23 carbon atoms;

and (ii) that the patent did not teach how the TREF parameter must be determined.

5.2 Concerning points (i.1) and (i.2), the Board observes that the Opponents, when objecting that copolymers, in which the alkyl group R may comprise up to 20 carbon atoms, and copolymers, which exhibit a molecular weight distribution greater than 6.4 in association with the requested TREF parameter, could not be prepared, have merely speculated without providing substantiating facts or evidence in support of these allegations.

5.3 According to the established jurisprudence of the Boards of Appeal, it is, however, with the Opponents invoking the partial invalidity of a patent on the ground that the invention cannot be carried out for certain compounds claimed, that the onus of proof rests for the facts they allege (see decisions T 182/89, OJ

EPO 1991, 391, point 2 of the reasons; T 16/87, OJ EPO 1992, 212, point 4 of the reasons).

5.4 In the absence of any pertinent evidence presented by them, the Opponents have not discharged the burden of proof which is upon them, with the consequence that the Board does not accept these submissions in these respects.

5.5 Concerning point (ii):

5.5.1 The Opponents have challenged the sufficiency of disclosure of the patent in suit in that respect on the grounds that it does not provide sufficient information as how to determine the TREF parameter, since it was not clear which method and which solvent should be used for carrying out the TREF analysis, and since it was not clear whether the 90% of the polymer eluted in TREF in a temperature range of 50°C should be based on the whole copolymer or on the crystalline part thereof.

5.5.2 In this connection, the Board firstly notes that the patent in suit contains a very detailed description of a method using o-xylene as solvent for the TREF analysis at page 8, lines 9 to 16.

5.5.3 Secondly, it cannot be contested that the description of this method is part of the Chapter "Characterizations" (cf. page 7, line 35), which is dedicated to the descriptions of the methods to be used for the determination of properties of the copolymer according to the patent in suit, i.e. intrinsic viscosity, melt indices, comonomer content, absolute density, apparent bulk density, measurements by

differential scanning temperature, solubility in xylene at 25°C, and TREF.

5.5.4 The Board further notes that the patent in suit (page 3, lines 23 to 25) also refers to the TREF analysis as disclosed in D15, which discloses in its experimental part a method for carrying out a TREF analysis using 1,2,4-trichlorobenzene as solvent (cf. D15, page 444, "Fractionation Procedure").

5.5.5 While it might hence be *prima facie* questionable whether it is the method disclosed on page 8 or the method referred to on page 3 which should be used for determining the TREF parameter set out in Claim 1 of the patent in suit, the description of the patent in suit must in the Board's view, be construed as though it were read by a person skilled in the art who will derive a realistic understanding of what is being disclosed.

5.5.6 In that context, it is evident, on the one hand, that the reference on page 3, lines 23 to 25 to the method of D15 merely amounts to a general presentation of TREF analysis and of the information this kind of analysis can provide, and on the other hand, that the method disclosed on page 8, lines 9 to 16, is the only TREF method which is fully detailed and effectively used in the patent in suit.

5.5.7 Thus, the Board sees no reason why the skilled person, when reading the description of the patent in suit, would deviate from the clear instructions, concerning in particular, the solvent used, given on page 8 for carrying out the TREF analysis.

5.5.8 Consequently, the Board comes to the conclusion that the skilled person is unambiguously taught by the patent in suit to carry out the TREF analysis by the method disclosed on page 8, lines 9 to 16 of the patent in suit using xylene as solvent, so that no insufficiency of disclosure can arise in that respect.

5.5.9 It thus remains to be decided whether the skilled person would obtain, from the disclosure of the patent in suit, the teaching concerning the basis on which the amount of the polymer eluted in TREF in a temperature range of 50°C should be calculated.

5.5.10 In that respect, the Board notes that the wording of Claim 1, when defining the TREF parameter, only states that "a quantity equal to at least 90% by weight of the **copolymer** (emphasis by the Board) is eluted in a temperature interval of less than 50°C". It is hence evident, in the Board's view, that in Claim 1 the term "copolymer" is intended to mean the claimed copolymer.

5.5.11 In this connection, the Board does not accept the submission of the Opponent II that the amorphous part of the copolymer would contain copolymers having an amount of comonomer well above 20 mole % which should be excluded from the calculation of the TREF parameter. This is because a copolymer consists of a statistical distribution of polymeric chains of varying lengths and comonomer content. Thus, the comonomer content indicated in Claim 1 represents only the average comonomer content of the whole copolymer and does not exclude that some polymeric chains might have a

comonomer content higher than 20% by mole or lower than 1% by mole.

5.5.12 Furthermore, while it might be true, as submitted by the Opponents, that the TREF analysis only detects the crystalline part of the copolymer, this clearly does not preclude, in the Board's view, the calculation of the relative amount eluted in a temperature range on the whole copolymer, so that that there is no technical inconsistency in the definition of the TREF parameter in Claim 1.

5.5.13 Consequently, it follows from the language of Claim 1 that the amount of eluted copolymer in the TREF analysis has to be calculated on the whole copolymer.

5.5.14 Thus, the question of sufficiency of disclosure boils down to the question of whether the description of the patent in suit would nevertheless instruct the skilled person to calculate the TREF parameter on the basis of the crystalline part of the copolymer, so that the skilled person would not know which basis should effectively be taken for calculating the TREF parameter.

5.5.15 In this connection, it is primarily evident, on the one hand, that the patent in suit makes no explicit reference to the crystalline part of the copolymer, and on the other hand, that the only elements which might suggest that the calculation of the TREF parameter should be based on the crystalline part of the copolymer would appear, in view of the submissions of the Opponents, to find their origin in the data concerning Example 9 of the patent in suit.

5.5.16 Example 9, which is in fact a comparative example, discloses an ethylene-butene copolymer having a butene content of 13.1 weight%, a molecular weight distribution of 7.9, an amount of 90% of copolymer eluted in TREF in an interval of 60°C and a solubility in xylene at 25°C of 15.9% (Table 2). The result of the TREF analysis of this copolymer is further illustrated in Figure 2.

5.5.17 In that respect, the Opponents have alleged that there is an incompatibility between the value indicated for the solubility in xylene at 25°C (15.8%) and the 90% amount of copolymer eluted in a 60°C interval during the TREF analysis if it were calculated on the whole copolymer. This is because, according to the Opponents, the amorphous part of the copolymer is represented by the portion soluble in xylene at 25°C and because only the crystalline part is detected in the TREF analysis. Thus, according to the Opponents, there could not be a 60°C temperature interval in TREF in which 90% of the **whole** copolymer is eluted, since the amorphous part already represents 15.9% of the copolymer and is in any case eluted below 25°C. Hence, according to the Opponents, it has to deduced that in Example 9 the calculation of the TREF parameter could only be based on the crystalline portion of the copolymer.

5.5.18 The Board, however, observes that the TREF analysis starts at 10°C (cf. page 8, line 15), so that a part of the copolymer of Example 9 which is soluble at 25°C in xylene also elutes between 10°C and 25°C (as also shown by Fig.2), i.e. in other words there is no exact correspondence between the amorphous part of the copolymer and the part of the copolymer soluble in

xylene below 25°C. Furthermore the steady conditions for determining the solubility in xylene at 25°C (page 8, lines 4 to 8) cannot be compared with the dynamic conditions in TREF, so that it cannot be concluded that the portion of copolymer soluble below 25°C in xylene will inevitably correspond to the portion eluted in xylene in TREF below 25°C. The further argument of the Opponent II that the spike normally corresponding to the amorphous portion of the copolymer is lacking on Figure 2, is also not pertinent, firstly since there was no obligation on the Patentee to include this spike in the schematic representation of the TREF analysis of Figure 2, and secondly, in the absence of an exact representation, it is not possible to deduce that the amount of copolymer corresponding to this spike would inevitably invalidate the calculation based on the whole copolymer.

5.5.19 Consequently, it cannot be deduced from the TREF parameter indicated for Example 9 in Table 2 that the value of this parameter was not calculated on the basis of the whole copolymer.

5.5.20 Thus, the only instruction that the skilled person receives in respect of the basis for the calculation of the TREF parameter from the patent as a whole is to carry out the calculation of the TREF parameter on the whole copolymer, so that no lack of sufficiency in the sense of Article 83 EPC can arise in respect of this feature.

5.6 Thus, for the reasons mentioned above in Section 5.5 the Board comes to the conclusion that it has not been shown to its satisfaction that there is a deficiency in

the patent in suit contrary to Article 83 EPC. Consequently the ground of opposition under Article 100(b) EPC cannot succeed.

5.7 This conclusion cannot be altered by the references made by the Opponents to the decisions T 256/87 and T 225/93.

5.7.1 In view of the decision T 256/87, the argument was that the skilled person would not know whether he is working in the forbidden area of the claims, since he does not know which method and which solvent should be used for the TREF analysis. Although, in the Board's view, this argument might appear to be rather associated with the scope of the claim, i.e. Article 84 EPC, than with sufficiency of disclosure (cf. also T 943/00 of 31 July 2003, not published in OJ EPO, Reasons for the Decision, point 10.5.1), it is in any case not pertinent here since for the reasons set above in paragraphs 5.5.2 to 5.5.7 the skilled person would indeed know which method and which solvent should be used for the TREF analysis.

5.7.2 In the case under consideration in T 225/93, there was no method indicated in the patent for determining the specific surface of a calcium carbonate filler, and it was agreed by the Parties that there were several methods known in the art for determining this property, but that they led to different results (Reasons for the Decision point 2). In contrast, in the present case, there is, as shown above, a clear indication in the patent in suit of the method to be used for the TREF analysis.

6. *Novelty*

6.1 Claim 1 is to be interpreted as requiring that the ethylene copolymer:

(i) is a copolymer with one α-olefin of the formula CH_2=CH-CH_2R, where R is hydrogen or a linear, branched or cyclic alkyl radical having 1 to 20 carbon atoms;

(ii) that it contains between 80 and 99 mol % of ethylene units and 1 to 20 mol % of units derived from α-olefin comonomer;

(iii) that in TREF (determined by the method according to page 8, lines 9 to 16 of the patent), a quantity equal to at least 90% by weight of the whole copolymer is eluted in a temperature interval of less than 50°C, and

(iv) that it exhibits a molecular weight distribution Mw/Mn > 3, where Mw is the weight-average molecular weight and Mn is the number-average molecular weight, both determined by GPC.

6.2 Lack of novelty of the subject-matter of Claim 1 has been alleged by the Opponent I in view of a repetition of Example 1 of D1 (carried out by Opponent I, and disclosed in document D21) and in view of Example 2 of D2.

6.3 According to Example 1 of D1 (cf. page 16, lines 32 to 33) ethylene is copolymerized with **4-methyl-1-pentene** (emphasis by the Board). The copolymer obtained has an intrinsic viscosity of 1.82 dl/g a density of 0.901

g/cm^3, a MFR_2 of 0.82g/10 min, a ratio MFR_{10}/MFR_2 of 10.5, a melting point at 95°C and an amount of portion soluble in n-decane of 1.6% by weight (page 16, lines 42 to 44). Example 1 of D1 does not indicate either the comonomer content or the molecular weight distribution of the copolymer. There is further no reference to TREF analysis in D1.

6.4 In contrast thereto, D21 discloses the copolymerization of ethylene with **1-hexene** (emphasis by the Board), which is said to lead to a copolymer containing 11.7 % by weight of 1-hexene, a content of ethylene of 95.8% by mole, a molecular weight distribution of 4.2. While D21 mentions that 100% of this copolymer is eluted within a temperature of 40°C interval in TREF, it does not, however, indicate the conditions under which the TREF analysis has been carried out.

6.5 It is thus immediately evident that the example disclosed in D21 used a different comonomer than Example 1 of D1. Furthermore while in Example 1 of D1 a 2-liter stainless autoclave is used for the polymerization, the polymerization according to D21 has been carried out in a 3-liter stainless autoclave. This has for its consequence that for maintaining the same pressure in the corresponding autoclaves (8 kg/cm^3 G in the first polymerization step, and 12 kg/cm^3 G in the second polymerization step) different amounts of ethylene (first step) and of ethylene and hydrogen (second step) must respectively be used. Taking further into account that 4-methyl-pentene and 1-hexene have different densities (0.665 for 4-methyl-1 pentene and 0.671 for 1-hexene) and that the same volume of comonomer (900ml) and the same amount of catalyst

(1.0 mmol of triisobutylaluminum, 0.1 mg atom of the organoaluminum oxy-compound in terms of aluminum atom and 0.001 mmol of bis(methylcyclopentadienyl) zirconium dichloride) have been used in both cases, it is hence evident that the ratio ethylene/comonomer and the ratio monomers/catalyst in the autoclave are totally different in Example 1 of D1 and in the process disclosed in D21.

6.6 Thus, D21 cannot be considered either as a repetition of Example 1 of D1 since the comonomers differ, or as a mere application of the process of Example 1 of D1 to the copolymerization of ethylene with a further comonomer disclosed in D1 (i.e. 1-hexene), since the process conditions have also been modified.

6.7 Taking further into consideration that D21 is totally silent on the conditions under which the TREF analysis has been carried out, the objection of lack of novelty of the subject-matter of Claim 1 in view of D21 must fail.

6.8 Example 2 of D2 discloses a copolymer of ethylene and 1-butene containing 3.5 mole % of 1-butene, having a molecular weight distribution determined by GPC of 3.7 (Table 1; page 3, lines 3 to 11; page 10, line 56 to page 11, line 2). In the TREF analysis carried out using o-dichlorobenzene as solvent, 100% of this copolymer elutes between 25°C and 90°C (Table 1; page 11, lines 39 to 43).

6.9 The Board notes that Example 2 of D2 has been repeated by the Patentee (cf. Annex 3 of the letter of 27 March 2001; see also document D20 submitted by Opponent I)

and a TREF analysis according to the method disclosed in the patent in suit (page 8, lines 9 to 16) using xylene as solvent has been carried out on the copolymer. The data submitted by the Patentee show that less than 90% by weight (87.97%) of this copolymer elutes in a temperature of 50°C.

6.10 The Board also observes that the Opponents have not challenged either the repetition of Example 2 of D2 by the Patentee or the results obtained in TREF according to the method disclosed in the patent in suit.

6.11 Thus, the Board can only state that the copolymer of Example 2 of D2 does not meet the requirements in terms of TREF set out in Claim 1 of the patent in suit, since the amount eluted in an interval of 50°C is less than 90% by weight based on the whole copolymer (cf. point (iii) in paragraph 6.1 above).

6.12 Consequently, the objection of lack of novelty of Claim 1 in view of Example 2 of D2 must also fail.

6.13 It thus follows from the above that the subject-matter of Claim 1, and by the same token that of dependent Claims 2 to 5 must be considered as novel (Article 54 EPC).

7. *Inventive step*

7.1 The patent in suit relates to copolymers of ethylene with a uniform distribution of the comonomer units within the polymer chain and with a wide molecular weight distribution, which can be used in the manufacture of films.

7.2 Such copolymers are known from document D2 which the Board, in accordance with the Opposition Division and the Parties regards as the closest state of the art.

7.3 D2 relates to ethylene/alpha-olefin copolymers having superior melt characteristics such as fluidity and having high impact resistance, mechanical strength, transparency and low-temperature heat sealability which can be used in the manufacture of films (page 2, lines 3 to 5; page 10, lines 41 to 42). In that respect it is clear from the introductory part of D2 (page 2, lines 15 to 18), that D2 is concerned with the provision of ethylene copolymers having a narrow comonomer distribution and a wide molecular weight distribution.

7.4 D2 relates to ethylene copolymers wherein the α-olefin comprises 4 to 20 carbon atoms, the content of the comonomer being preferably 0.5 and 20 mole % (page 2, lines 4 to 10). The molecular weight distribution is in the range from 2 to 15, preferably from 2.5 to 10 (page 3, lines 22 to 26). Document D2 uses a TREF analysis with o-dichlorobenzene as solvent (page 11, lines 39 to 43) for the characterization of the copolymers, according to which the eluted quantity at 95°C or higher in temperature rising elution fractionation should usually be not larger than 5 %, preferably not larger than 3 %, and a soluble matter content at 25°C C or lower should usually be not higher than 2 %, preferably not higher than 1 % (page 4, lines 6 to 9); i.e. implying that at least 97% of the copolymer elutes in a temperature range of 70°C.

7.5 More particularly, as indicated above in paragraph 6.8, Example 2 of D2 discloses a copolymer of ethylene and 1-butene containing 3.5 mole % of 1-butene and a molecular weight distribution of 3.7. Furthermore, 100% of this copolymer elutes in temperature range of 65°C in the TREF analysis according to D2, and it has been shown that 87.97% of this copolymer elutes in a temperature range of 50°C according to the TREF analysis of the patent in suit, instead of at least 90% by weight as required by the patent in suit. In other words the polymers of the patent in suit differ from that of Example 2 only by a higher TREF parameter as determined in the patent in suit, and thus, as assumed by the patent in suit, by a more uniform (i.e. a narrower) comonomer distribution.

7.6 Provided the patent in suit would have been directed to a process for the manufacture of such copolymers having an extremely uniform distribution of the comonomer units and a broad molecular weight distribution (cf. page 2, line 57 to page 3, line 3), starting from D2 (in particular Example 2 thereof) the technical problem could have been seen in the provision of a process for producing copolymers having a narrower comonomer distribution.

7.7 This is however not the case here, since the claims of the patent in suit are directed only to the copolymers "per se".

7.8 Nevertheless, it might be considered, as submitted by the Patentee, that the subject-matter of Claim 1 of the patent in suit is concerned with a desideratum of ethylene copolymers with a broad molecular weight

distribution and a narrower comonomer distribution (cf. also page 2, lines 47 to 48 of the patent in suit).

7.9 Whilst, in that context, the question of obviousness of the subject-matter of such a claim could be linked to the question as to whether there was no known way or applicable (analogy) method in the art to make it at the priority date of the patent in suit (cf. T 595/90; Headnote 2), this would however presuppose that the claimed copolymers effectively concretize the expressed desideratum.

7.10 As indicated in the patent in suit, the TREF analysis gives information on the comonomer distribution and the more restricted the resulting temperature interval in which the polymer elutes, the more uniform the comonomer distribution will be (cf. page 3, lines 26 to 29). As further stated in the patent in suit, a higher uniformity of distribution allows lower density and crystallinity to be obtained with the same type and quantity of comonomer (page 2, lines 16 to 18).

7.11 In this connection, the Board observes, however, that the copolymer of Example 2 of D2 exhibits a density of 0.9210, for a comonomer (1-butene) content of 3.5 % in mole, i.e. 6.9 % by weight, while the copolymer of Example 6 of the patent in suit exhibits the same density for a 1-butene content of 8.2 % by weight. This clearly implies that the copolymer of Example 2 of D2 achieves the same density for a much lower amount of comonomer, although it would have been assumed, in view of the "inferior" result achieved in TREF according to the method of the patent in suit by the copolymer of

Example 2 of D2, that its density be higher than that of the copolymer of the Example 6 of the patent in suit.

7.12 The Board further notes that Examples 1 and 3 of D2 also achieve lower densities (0.9188, 0.9086) than the copolymer of Example 6 of the patent in suit for lower or equal amounts of 1-butene (5.5% by weight and 6.9% by weight).

7.13 Consequently, the TREF parameter indicated in Claim 1 of the patent in suit would appear as not being associated with a narrowing of the comonomer distribution and might furthermore possibly correspond to a broadening of the comonomer distribution. In other words, the claimed copolymers cannot be considered as the concretization of the desideratum expressed above in paragraph 7.8 above.

7.14 Thus, starting from Example 2 of D2, a basis for the formulation of the technical problem underlying the patent in suit must be sought in relation to other technical effects which could be associated with the TREF parameter and which are derivable from the patent in suit.

7.15 In this connection, the Board firstly notes that the patent in suit contains absolutely no experimental data concerning either the manufacture of films or the properties of films made from the claimed copolymers, so that no effect of the TREF parameter on these properties can be discerned in the patent in suit.

7.16 Nor could the TREF parameter be associated either with a lowering of the melting temperature of the copolymers, since the copolymers of D2 have a melting temperature in the same range i.e. 70 to 120°C (cf. D2 page 3, lines 41 to 42) as those of the patent in suit (i.e. below to 120°C to below 100°C; page 3, lines 38 to 39), or with an improvement in processability, since, on the one hand, the processability is usually linked with the molecular weight distribution (as also admitted in the patent in suit, page 2, lines 26 to 28) and since, on the other hand, the copolymers of Examples 1 to 5 of D2 exhibit a higher melt index I_2 (cf. Table 1) than those of Examples 1, 3, 5, and 6 of the patent in suit (cf. Table 2).

7.17 Thus, the Board can only come to the conclusion that the TREF parameter indicated in Claim 1 has at best no technical function and may even be technically disadvantageous. Following the principles set out in the decision T 158/97 of 4 April 2000 (not published in OJ EPO; Reasons point 2.3), such a non functional feature is irrelevant to inventive step, even if the skilled person would never think of such modification, and the subject-matter of Claim 1 must be hence considered as lacking inventive step.

7.18 Consequently, the decision under appeal must be set aside and the patent be revoked.

Order

For these reasons it is decided that:

1. The appeal of the Patentee is inadmissible.

2. The decision under appeal is set aside.

3. The patent is revoked.

The Registrar: The Chairman:

E. Görgmaier R. Young