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**D E C I S I O N**  
**of 30 September 2004**

**Case Number:** T 0564/02 - 3.3.3

**Application Number:** 93307190.4

**Publication Number:** 0588581

**IPC:** C08F 297/08

**Language of the proceedings:** EN

**Title of invention:**

Polypropylene block copolymers and films thereof

**Patentee:**

SUMITOMO CHEMICAL COMPANY LIMITED

**Opponent:**

Union Carbide Corporation

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 83, 84, 102(3), 111(1), 123(2), 123(3)  
EPC R. 29(1)(a)

**Keyword:**

"Novelty (main request) - no"  
"Product-by-process - feature not distinguishing"  
"Sufficiency (auxiliary request) - yes"  
"Novelty (auxiliary request) - yes"

**Decisions cited:**

G 0010/91, T 0205/83, T 0301/87, T 0766/91

**Catchword:**

-



Case Number: T 0564/02 - 3.3.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.3**  
**of 30 September 2004**

**Appellant:** SUMITOMO CHEMICAL COMPANY LIMITED  
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**Respondent:** Union Carbide Corporation  
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**Representative:** Hayes, Adrian Chetwynd  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office dated 6 March 2002 and  
posted 3 April 2002 revoking European patent  
No. 0588581 pursuant to Article 102(1) EPC.**

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** C. Idez  
E. Dufrasne

## Summary of Facts and Submissions

I. The grant of the European patent No. 0 588 581 in the name of Sumitomo Chemical Company Limited in respect of European patent application No. 93 307 190.4 filed on 13 September 1993 and claiming priority of the JP patent applications No. 246159/92 and 246160/92 both filed on 16 September 1992 was announced on 13 August 1997 (Bulletin 1997/33) on the basis of 8 claims.

Claims 1, 6, 7 and 8 read as follows:

"1. A polypropylene block copolymer obtained, using a Ziegler-Natta catalyst, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount of from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]_B$ ) is at least 2.0 dl/g, and the ratio  $[\eta]_B/[\eta]_A$ , where  $[\eta]_A$  is the intrinsic viscosity of the component A, is 1.8 or less.

6. A block copolymer as claimed in any preceding claim, wherein the content of components having a molecular weight of 50,000 or less in the 20°C xylene-soluble component in the total polymer after melt-kneading is 2.0% by weight or less.
7. Film formed by melt-extruding polypropylene block copolymer as claimed in claim 6.
8. Composite film including at least one layer formed of film as claimed in claim 6."

Claims 2 to 5 were dependent claims.

II. On 12 May 1998, a Notice of Opposition was filed by Union Carbide Corporation, in which revocation of the patent in its entirety was requested on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC), and on the ground of insufficiency of disclosure (Article 100(b) EPC).

The opposition was supported, *inter alia*, by the following documents:

D1: EP-A-0 457 455;

D2: EP-A-0 086 300;

as well as the later filed, but admitted, documents:

D3: F.P. Baldwin and G. Ver Strate "Polyolefin Elastomers Based on Ethylene and Propylene", Rubber Chemistry and Technology, Vol. 45, (1972), pages 709-711, 732-733, 750-755;

D4: Journal of Applied Polymer Science, Vol.14, 1970,  
pages 1651-1653, and

D7: EP-A-0 863 183;

III. By a decision announced orally on 6 March 2002 and issued in writing on 3 April 2002, the Opposition Division revoked the patent.

IV. The decision of the Opposition Division was based on Claims 1 to 8 as submitted with letter dated 11 January 2002 as main request, and on Claims 1 to 7 as submitted with letter 11 January 2002 as auxiliary request.

Claim 1 of the main request reads as follows:

"A polypropylene block copolymer obtained, using a Ziegler-Natta catalyst, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]_B$ ) is at least 2.0 dl/g, and the ratio  $[\eta]_B/[\eta]_A$ , where  $[\eta]_A$  is

the intrinsic viscosity of the component A, is 1.8 or less, the intrinsic viscosity  $[\eta]_A$  of component A being measured in tetralin at 135°C after completion of the polymerization in the first step and the intrinsic viscosity  $[\eta]_B$  of component B being determined by the equation.

$$[\eta]_A \times PA/100 + [\eta]_B \times PB/100 = [\eta]_{AB}$$

wherein  $[\eta]_{AB}$  represents the intrinsic viscosity of the block copolymer measured likewise in tetralin at 135°C after completion of the polymerization in the second step, and PA, PB represent the contents of components A,B respectively in the block copolymer."

Claims 2 to 8 correspond to Claims 2 to 8 as granted.

Claim 1 of the auxiliary request reads as follows:

"A polypropylene block copolymer obtained, using a Ziegler-Natta catalyst, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]_B$ ) is at least 2.0 dl/g, and the ratio  $[\eta]_B/[\eta]_A$ , where  $[\eta]_A$  is

the intrinsic viscosity of the component A, is 1.8 or less, the intrinsic viscosity  $[\eta]_A$  of component A being measured in tetralin at 135°C after completion of the polymerization in the first step and the intrinsic viscosity  $[\eta]_B$  of component B being determined by the equation.

$$[\eta]_A \times PA/100 + [\eta]_B \times PB/100 = [\eta]_{AB}$$

wherein  $[\eta]_{AB}$  represents the intrinsic viscosity of the block copolymer measured likewise in tetralin at 135°C after completion of the polymerization in the second step, and PA, PB represent the contents of components A,B respectively in the block copolymer, and wherein the content of components having a molecular weight of 50,000 or less in the 20°C xylene- soluble component in the total polymer after melt- kneading is 2.0% by weight or less."

Claims 2 to 5 correspond to Claims 2 to 5 of the main request and Claims 6 to 7 correspond to Claims 7 to 8 of the main request.

The Opposition Division revoked the patent on the grounds that the subject-matter of the main request was not novel and that of the auxiliary request did not comply with the requirements of Article 83 EPC.

In its decision, the Opposition Division held that the main request met the requirements of Articles 123(2), 123(3), 84, and 83 EPC but that its subject-matter lacked novelty over the disclosure of document D1.

According to the decision Example 1, Sample 2 of D1 disclosed a polypropylene block copolymer having a copolymer fraction of 26.2% by weight and thus a

polypropylene homopolymer fraction of 73.8% by weight, a melt flow (without visbreaking) of 4.8 dg/min and a ratio of intrinsic viscosity (measured in decalin) of 1.2.

The Opposition Division stated that the conversion factor between intrinsic viscosity in tetralin and intrinsic viscosity in decalin which might be derived from document D3 could not be taken into consideration for the assessment of novelty.

Nevertheless, the Opposition Division took the view that the intrinsic viscosities of the intermediate components A and B before melt kneading as mentioned in Claim 1 of the main request could not be determined from the final copolymer obtained after melt kneading, and could be arbitrarily chosen.

Thus, the Opposition Division came to the conclusion that the final product was characterized by the respective proportions of components A and B and its melt flow, and that this product was known from D1.

Concerning the auxiliary request, the decision held that the person skilled in the art did not get a technical teaching from the opposed patent how to adjust the polymerisation conditions, in particular the concentration of hydrogen, in order to reduce the low molecular weight components in the 20°C xylene soluble fraction in the polymer after melt kneading to 2% by weight or less.



V. A Notice of Appeal was filed on 29 May 2002 by the Appellant (Patent Proprietor). The appeal fee was paid on 30 May 2002. With the Statement of Grounds of Appeal filed on 9 August 2002, the Appellant submitted five sets of claims representing a main request and four auxiliary requests referred to as A1 to A4. The main request and auxiliary request A1 corresponded to the main request and the auxiliary request on which the decision of the opposition division was based, respectively.

Claim 1 of the auxiliary request A2 reads as follows:

"A polypropylene block copolymer obtained, using a Ziegler-Natta catalyst containing at least titanium, magnesium and halogen, as essential components, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene- propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]B$ ) is at least 2.0 dl/g, and the ratio  $[\eta]B/[\eta]A$ , where  $[\eta]A$  is the intrinsic viscosity of the component A, is 1.8 or less, the intrinsic viscosity  $[\eta]A$  of component A being measured in tetralin at 135°C

after completion of the polymerization in the first step and the intrinsic viscosity  $[\eta]_B$  of component B being determined by the equation.

$$[\eta]_A \times PA/100 + [\eta]_B \times PB/100 = [\eta]_{AB}$$

wherein  $[\eta]_{AB}$  represents the intrinsic viscosity of the block copolymer measured likewise in tetralin at 135°C after completion of the polymerization in the second step, and PA, PB represent the contents of components A,B respectively in the block copolymer."

Claims 2 to 7 correspond to Claims 3 to 8 of the main request.

The only Claim of auxiliary request A3 reads, after correction of a typographical error, as follows:

"A method of obtaining a polypropylene block copolymer using a Ziegler Natta catalyst, comprising a first step of polymerizing a monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, a second step of polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block, copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]_B$ ) is at least 2.0 de/g [sic], and the ratio  $[\eta]_B/[\eta]_A$ , where  $[\eta]_A$  is the intrinsic viscosity of the component A, is

1.8 or less, the intrinsic viscosity of component A being measured in tetralin at 135°C after completion of the polymerization in the first step and the intrinsic viscosity  $[\eta]B$  of component B being determined by the equation:

$$[\eta]A \times PA/100 + [\eta]B \times PB/100 = [\eta]AB$$

wherein  $[\eta]AB$  represents the intrinsic viscosity of the block copolymer measured likewise in tetralin at 135°C after completion of the polymerization in the second step, and PA, PB represent the contents of component A,B respectively in the block copolymer."

Claim 1 of auxiliary request A4 reads as follows

"A polypropylene block copolymer obtained, using a Ziegler-Natta catalyst containing at least titanium, magnesium and halogen, as essential components, by polymerizing in a first step monomer comprising propylene to form a polymer comprising polypropylene (component A) in an amount of from 60 to 75% by weight of the total polymer amount in the substantial absence of inert solvent first and then, in a second step, polymerizing a mixture of ethylene and propylene in the vapor phase to form an ethylene-propylene copolymer (component B) having an ethylene content of from 20 to 50% by weight in an amount from 25 to 40% by weight of the total polymer amount, and melt-kneading the resulting polypropylene block copolymer, the melt flow rate of the melt-kneaded polypropylene block copolymer, measured according to JIS K7210 condition 14, is from 0.5 to 10 g/10 minutes and the intrinsic viscosity of component B ( $[\eta]B$ ) is at least 2.0 dl/g, and the ratio  $[\eta]B/[\eta]A$ , where  $[\eta]A$  is the intrinsic viscosity of the component A, is 1.8 or less, the intrinsic viscosity

[ $\eta$ ]A of component A being measured in tetralin at 135°C after completion of the polymerization in the first step and the intrinsic viscosity [ $\eta$ ]B of component B being determined by the equation:

$$[\eta]A) \times PA/100 + [\eta]B \times PB/100 = [\eta]AB$$

wherein [ $\eta$ ]AB represents the intrinsic viscosity of the block copolymer measured likewise in tetralin at 135°C after completion of the polymerization in the second step, and PA, PB represent the contents of components A,B respectively in the block copolymer, and wherein the content of components having a molecular weight of 50,000 or less in the 20°C xylene- soluble component in the total polymer after melt-kneading is 2.0% by weight or less."

Claims 2 to 6 correspond to claims 3 to 7 of the first auxiliary request.

The arguments presented by the Appellant may be summarized as follows:

(i) Concerning the main request:

(i.1) In document D1 the intrinsic viscosity was measured in decalin at 135°C, while it was determined in tetralin at 135°C in the patent in suit.

(i.2) It was well known that the viscosity values depended upon the solvent used.

(i.3) The Opponent had tried to derive a conversion factor from document D3 between viscosities determined in decalin and viscosities determined in tetralin.

(i.4) However, since the polymers disclosed in D3 were not the same as those of the patent in suit, the conversion factor obtained from D3 would not be applicable to the polymers of the patent in suit.

(i.5) Thus, D1 could not deprive the patent in suit of novelty.

(ii) Concerning auxiliary request A1:

(ii.1) The person skilled in the art would know how hydrogen could be used to control the molecular weight.

(ii.2) This was also stated in D1 (page 4, lines 27 to 28).

(ii.3) The subject-matter of the auxiliary request A1 was also novel over D1, since D1 did not refer to the low molecular weight xylene soluble fraction.

VI. The arguments presented by the Respondent (Opponent) in its letters dated 5 March 2003 and 6 August 2004 may be summarized as follows:

(i) Concerning the main request:

(i.1) Claim 1 did not meet the requirements of Article 123(2) EPC, since it did not contain the features mentioned at the bottom of page 4 of the patent in suit concerning the determination of the contents of components A and B.

(i.2) Claim 1 did not meet the requirements of Article 84 EPC, since it did not include the viscosity measurement technique indicated at the bottom of page 4 of the patent in suit.

(i.3) The patent in suit did not disclose to the skilled person how he could determine the original viscosities of the polymer blocks from the final visbroken block copolymer. Thus, the skilled person could not determine whether the final polymer fell within the scope of the claims. Consequently, the main request did not meet the requirements of Articles 83 and 84 EPC.

(i.4) As could be derived from the decision of the Opposition Division, the viscosities of the intermediate components were no longer applicable to the final products. Thus, only the properties of the final product could be used to distinguish the claimed product from the prior art.

(i.5) Thus, Sample 2 of Example 1 of D1 fell within the scope of Claim 1 of the main request.

(i.6) In view of the disclosure of document D7 used as an experimental report, a relationship between inherent viscosity and melt flow rate could be determined.

(i.7) The compositions of D7 and the process for making them were very similar to those of D1 and of the patent in suit.

(i.8) It could further be shown that the equation set out at the top of page 6 of D1 for calculating the intrinsic viscosity ratio would be applicable for the compositions of D7 and those of the patent in suit.

(i.9) Thus, it could be established that the intrinsic viscosities of the intermediate products of D1 fell within the requirements of Claim 1.

(ii) Concerning auxiliary request A1:

(ii.1) Although Examples 2 to 5 would appear to illustrate the invention, it was merely explained that the procedure of Example 1 had been followed except for changing the concentration of hydrogen in the first step, the concentration of hydrogen and ethylene in the second step and the amount of visbreaking agent, without, however, explaining these parameters in any more detail.

(ii.2) Thus, there was no teaching in the patent in suit as how the skilled person could obtain an amount of low molecular weight components of at most 2% by weight without undue experimentation.

(ii.3) Thus, this request would contravene Article 83 and 84 EPC.

(ii.4) The subject-matter of this request lacked novelty over D1, since the new requirement in Claim 1 (i.e. amount of low molecular weight compounds) simply mirrored a familiar requirement for films used in food packaging.

(iii) Concerning auxiliary request A2:

(iii.1) The Appellant had presented no supporting argumentation for this request.

(iii.2) Thus, this request should be considered as inadmissible. Furthermore Claim 1 thereof would lack novelty, since the composition of the Ziegler Natta catalyst was disclosed in D1.

(iv) Concerning auxiliary request A3:

(iv.1) D1 disclosed all the process features of the claimed method.

(iv.2) This request would contravene Article 83 EPC, since Claim 1 did not refer to the use of a peroxide in the melt kneading step.

(v) Concerning auxiliary request A4:

(v.1) The Appellant had presented no supporting argumentation for this request.

(v.2) Thus, this request should be considered as inadmissible. Furthermore this request would contravene Article 83 EPC for the same reasons as indicated for auxiliary request A1.



VII. Oral proceedings were held on 30 September 2004.

At the beginning of the oral proceedings, the Appellant indicated that it withdrew its auxiliary requests A2 and A4. In the course of the oral proceedings it further withdrew its auxiliary request A1.

(i) The submissions made by the Parties in respect of the main request may be summarized as follows:

(i.1) Concerning the formal admissibility of the main request:

(i.1.a) By the Respondent

(i.1.a.1) The Respondent indicated that it relied on its submissions in the written phase of the appeal proceedings.

(i.1.b) By the Appellant:

(i.1.b.1) The formula mentioned in Claim 1 giving the relation between the intrinsic viscosities of component A, of component B and of the final block copolymer AB was disclosed at page 5, lines 5 to 10 of the patent in suit.

(i.1.b.2) Thus Claim 1 met the requirements of Article 123(2) EPC.

(i.2) Concerning novelty:

(i.2.a) By the Respondent:

(i.2.a.1) Claim 1, which was drafted as a product by process claim, must be interpreted as referring to a product obtainable by the process mentioned therein.

(i.2.a.2) While some features of the process such as the amount of component A, the amount of component B, the amount of ethylene in B would come through to the end-product, it was evident that the intrinsic viscosities of component A and B as well as the ratio thereof were modified by melt-kneading in presence of a peroxide as done in the Examples 1 to 5 of the patent in suit, so that these features were no longer relevant or the characterization of the end-polymer.

(i.2.a.3) Thus, samples 2 and 7 of Table 1 of D1 must be regarded as novelty destroying.

(i.2.b) By the Appellant:

(i.2.b.1) The process features set out in Claim 1 were part of the definition of the claimed block copolymer and could not be ignored when assessing novelty.

(i.2.b.2) The claimed polymer was characterized by parameters (i.e. the intrinsic viscosity of the components A and B before the melt-kneading step) which showed how the polymer had been obtained.

(i.2.b.3) This implied that the polymer before the kneading step must exhibit a specific molecular structure, which would be mirrored in the structure of the end-product.

(i.2.b.4) Since document D1 did not disclose the intermediate viscosities of the components A and B, it could not destroy the novelty of the subject-matter of Claim 1.

(ii) The submissions of the Parties concerning auxiliary request A3 may be summarized as follows:

(ii.1) The Respondent indicated that it had no objection either under Article 123 EPC or under Article 84 EPC against the claim of auxiliary request A3.

(ii.2) Concerning Article 83 EPC:

(ii.2.a) By the Respondent:

(ii.2.a.1) As shown in the Annex submitted with the letter of 6 August 2004 (cf. Table entitled "Determination of melt flows for examples of invention in EP 0 588 581 B1"), the melt flows of the polymer before visbreaking were rather low, and thus, the use of a peroxide was necessary to obtain the claimed melt flow rates.

(ii.2.a.2) Thus, the use of a peroxide in the melt kneading step was an essential feature of the claimed process.

(ii.2.a.3) This feature was, however, missing in Claim 1. Therefore, this request did not comply with Article 83 EPC.

(ii.2.b) By the Appellant:

(ii.2.b.1) The description of the patent in suit (cf. page 3, lines 43 to 45) clearly indicated that the melt-kneading step could be carried in the presence or absence of a peroxide.

(ii.2.b.2) This meant that the presence of a peroxide was purely optional to obtain a block copolymer with the required melt flow rate.

(ii.2.b.3) Furthermore, document D1 showed that a block copolymer with a melt flow rate between 0.2 and 70 could be obtained without visbreaking, and that a further increase in melt flow rate to the range 2 to 200 could be obtained by visbreaking (cf. D1, page 5, lines 16-28).

(ii.3) Concerning novelty:

(ii.3.a) By the Respondent:

(ii.3.a.1) It could be deduced from document D3 that there was a linear relationship between the intrinsic viscosity in decalin at 135°C and viscosity in tetralin at 135°C for all ethylene propylene copolymers (cf. D3, page 755, lines 31 to 34). The exact value of the conversion factor between viscosity in decalin and viscosity in tetralin was not relevant, since it would disappear when making the ratio between the intrinsic viscosity of component B and the intrinsic viscosity of component A.

(ii.3.a.2) Document D1 (page 6, lines 1 to 13) disclosed a relationship between the ratio of intrinsic viscosity (decalin at 135°C) of the ethylene/propylene copolymer (i.e. component B) to the intrinsic viscosity (decalin 135°C) of the homopolymer (i.e. component A) and the melt flow rates of the block copolymer, the melt flow rate of the homopolymer, and the fraction of ethylene/propylene copolymer in the block copolymer, as illustrated by the formula:

$$\text{Ratio} = 1 + \frac{\left[ (\text{MF}_{\text{homo}}/\text{MF}_{\text{whole}})^{0.213-1} \right]}{F_c}$$

(ii.3.a.3) As shown in Table A annexed to the letter of 6 August 2004, if one applied this formula to the calculation of the ratio of the intrinsic viscosity (decalin at 135°C) of the ethylene/propylene copolymer component to the intrinsic viscosity (decalin at 135°C) of the homopolymer component of the block copolymers disclosed in the Examples 1 to 14 of D7, one came to a very good agreement between the values calculated from the formula given in D1 and those indicated in D7 for the ratio of the intrinsic viscosities of these components of the block copolymers of Example 1 to 14 determined in tetralin at 135°C.

(ii.3.a.4) Thus, it was clear that the value of the ratio between the intrinsic viscosity of the component A and the intrinsic viscosity of component B was not dependent on the solvent used (decalin or tetralin) for the determination of the intrinsic viscosities at 135°C.

(ii.3.a.5) From this formula, it was further possible to determine the melt flow rate of the homopolymer component of the block copolymer disclosed in Samples 2, 4, 6, 7 and 11 of Example 1 of D1 (cf. Table B annexed to the letter of 6 August 2004 of the Respondent).

(ii.3.a.6) From document D4 it was deduced that there was a 3.4 power dependence between the melt viscosity on molecular weight, and that MFR (melt flow rate) was inversely related to melt viscosity (cf. D4. last two lines on page 1652). It was further general knowledge that the melt flow rate of a block copolymer AB having blocks A and B was given by the equation:

$$1/\text{MFR}_{\text{AB}}^{1/3.4} = W_{\text{A}}/\text{MFR}_{\text{A}}^{1/3.4} + W_{\text{B}}/\text{MFR}_{\text{B}}^{1/3.4} ,$$

in which  $W_{\text{A}}$  and  $W_{\text{B}}$  are the weight fractions of components A and B in the block copolymer and  $\text{MFR}_{\text{AB}}$ ,  $\text{MFR}_{\text{A}}$ , and  $\text{MFR}_{\text{B}}$  are the melt flow rates of the block copolymer, of component A, and of component B, respectively.

(ii.3.a.7) Thus, on that basis, the MFR of the component B of the block copolymer of the Samples 2, 4, 6, 7 and 11 of D1 could be calculated (cf. Table B, as indicated above).

(ii.3.a.8) From the examples of document D7 a correlation between the intrinsic viscosity in tetralin of the ethylene/propylene component (component B) and its intrinsic viscosity in tetralin at 135°C could be determined (cf. Table C and graph representing the

relationship between intrinsic viscosity of component B and MFR annexed to the letter of 6 August 2004).

(ii.3.a.9) It could thus be concluded that the Samples 2 and 7 of Table 1 of D1 had an intrinsic viscosity of block B of at least 2.0 in tetralin at 135°C and that the ratio of the intrinsic viscosity (tetralin at 135°C) of the block B to that of the block A of these respective samples was lower than 1.8.

(ii.3.a.10) Furthermore, since these block copolymers used in these Samples had been injection molded, the block copolymers had been inevitably melt kneaded.

(ii.3.a.11) Thus, D1 was a novelty destroying document for the subject-matter of the auxiliary request A3.

(ii.3.b) By the Appellant:

(ii.3.b.1) Document D7 was a post-published document. It could not therefore be taken into account for the assessment of novelty.

(ii.3.b.2) It could be accepted that a melt kneading step had been carried out in the manufacture of the Samples 2 and 7 of Table 1 of D1. Thus, D1 disclosed all the steps of the claimed process except the intrinsic viscosity in tetralin of component B of the block copolymer and the ratio of the intrinsic viscosities in tetralin of the component B to that of the component A before melt-kneading.

(ii.3.b.3) Thus, D1 could not destroy the novelty of the subject-matter of the auxiliary request A3.

Following observations from the Board according to which (i) document D4 did not seem to disclose the relationship mentioned by the Respondent between the melt flow rates of the copolymers and that of its components (cf. paragraph (ii.3.a.6), above), and (ii) according to which the comparison of the calculation of the intrinsic viscosity ratio of the component B to that of component A based on the formula given at page 3, lines 16 to 24 of D1, i.e.:

$$[\eta]_{\text{copol}} = \frac{[\eta]_{\text{prod}} - (1 - F_c) [\eta]_{\text{homo}}}{F_c}$$

with that obtained from the formula given at page 6 of D1 rendered it questionable as to whether the block copolymers of D1 would follow the same relationship between their intrinsic viscosity and their melt flow rate as shown by the Respondent in Figure 1 annexed to the letter of 6 August 2004, the Respondent submitted concerning point (i) that the relationship between the melt flow rates of the copolymers and that of its components was well known to those skilled in the art and that the melt flow rates of the copolymers exemplified in D7 complied with this formula, and concerning point (ii) that pure algebraic considerations could not be applied to polymer chemistry.

VIII. The Appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request or of the auxiliary request A3, filed with the letter dated 9 August 2002. In the



alternative, he requested that the case be remitted to the first instance for examination of inventive step.

The Respondent requested that the appeal be dismissed. In the alternative, he requested that the case be remitted to the first instance for examination of inventive step.

### **Reasons for the Decision**

1. The appeal is admissible.

#### *Main request*

2. *Wording of the claims:*
  - 2.1 It is firstly noted by the Board that an objection under Article 100(c) EPC has neither been raised against the granted patent by the Opponent, nor dealt with in the appealed decision.
  - 2.2 This has as a consequence that the assessment of the allowability of the claims of the main request under Article 123(2) EPC must be limited to that of the amendments made during the opposition and/or opposition appeal proceedings (G 10/91 OJ EPO, 1993, 420).
  - 2.3 Claims 1 to 8 of the main request differ from Claims 1 to 8 as granted in that (i) the method for the determination of the intrinsic viscosities of component A and of the block copolymer AB has been indicated in Claim 1, in that (ii) the equation for calculating the intrinsic viscosity of the component B have been

incorporated in Claim 1, and in that (iii) Claim 8 is dependent on Claim 7 instead of on Claim 6 in the granted version.

2.4 Concerning amendments (i) and (ii) it cannot be contested that they are supported by the application as originally filed (cf. page 5, lines 10 to 17 of the published application EP-A2-0 588 581).

2.5 While, as submitted by the Respondent, the equation for calculating the intrinsic viscosity of the component B makes use of the contents of component A (i.e. PA) and of component B (i.e. PB) in the block copolymer, and the application as originally filed mentions that the contents PA and PB are determined from the material balance of the polymerization (page 5, lines 5 to 8 of the published application), it is true that this later indication is missing from Claim 1.

2.6 Thus, the question of the allowability of Claim 1 under Article 123(2) EPC boils down to the question as to whether, as submitted by the Respondent, the absence of this indication can generate an extension of the subject-matter beyond the content of the application as filed.

2.6.1 In the Board's view, the objection raised by the Respondent is based on the argument that the amount PA of component A and the amount PB of component B in the block copolymers are dependent on the method used for their determination, in other words that the method of determination is part of the definition of the values of PA and PB.

- 2.6.2 In this connection, it is, however, evident that granted Claim 1 explicitly referred to the amounts of components A and B, since it stipulated that A should be present in an amount of 60 to 75 weight % and that component B should be present in an amount of 25 to 40 weight %, without mentioning any method for the determination of the respective amounts of the components A and B. This implies that in granted Claim 1 the amounts of components A and B were not linked to a specific method for their determination.
- 2.6.3 This cannot be altered by the fact that the contents of components A and component B have merely been labelled as PA and PB in the equation for determining the intrinsic viscosity in tetralin of component B which has been incorporated in Claim 1. Thus, in accordance with the principles set out in G 10/91, the absence of the method indicated at page 5, lines 5 to 8 of the published application in Claim 1 cannot give rise to an objection under Article 123(2) EPC.
- 2.6.4 Consequently, Claim 1 must be regarded as meeting the requirements of Article 123(2) EPC.
- 2.7 Concerning amendment (iii), although the reference in granted Claim 8 to a film as claimed in Claim 6 could have been considered as an obvious error, Claim 8, in any case, finds its support on page 4, lines 46 to 51 of the published application, so that the requirements of Article 123(2) EPC must be regarded as met.
- 2.8 Having regard to the modifications made in Claims 1 and 8, the Board comes further to the conclusion that they cannot lead to an extension of the protection conferred

by the claims as granted. The requirements of Article 123(3) EPC are therefore complied with.

2.9 Article 84 EPC

2.9.1 When amendments are made to a patent during an opposition, Article 102(3) EPC requires consideration as to whether the amendments introduce any contravention of any requirement of the Convention, including Article 84 EPC. Article 102(3) EPC, however, does not allow objections to be based upon Article 84 EPC, if such objections do not arise out of the amendments made (cf. also decision T 301/87; OJ EPO, 1990, 335; Headnote 1).

2.9.2 As indicated above in paragraph 2.6.2 above, the Board notes that the indication of the content of component A and component B was already present in granted Claim 1, without any reference to any method for its determination such as the methodology disclosed on page 5, lines 5 to 8 of the published application.

2.9.3 Since the objection under Article 84 EPC raised by the Respondent is *de facto* based on the absence of indication of this methodology in Claim 1 of the main request, it is evident that the mere use of the content of component A and of component B in terms PA and PB in the formula given in Claim 1 for determining the intrinsic viscosity of component B cannot generate a lack of clarity in the context of Claim 1.

2.9.4 It thus follows that the objection raised under Article 84 EPC by the Respondent against Claim 1 cannot be allowed.

2.9.5 Consequently, the Board comes to the conclusion that the requirements of Article 84 EPC read in connection with Article 102(3) EPC are met by all the claims.

### 3. *Novelty*

3.1 Document D1 relates to a polypropylene impact copolymer composition which comprises a homopolymer phase predominantly comprising a propylene homopolymer and a copolymer phase predominantly comprising a copolymer of ethylene and propylene, wherein the ratio of the intrinsic viscosity (determined at 135°C in decalin) of the copolymer phase to that of the homopolymer phase is from 0.7/1 to 1.3/1, preferably from 1.0/1 to 1.2/2 (Claims 1, 5). The composition is obtainable by a two-stage polymerization process wherein the two-stage polymerization process is a gas phase process wherein predominantly propylene is initially polymerized to form the homopolymer phase and the product of the initial polymerization is contacted with a mixture of propylene and ethylene to form the copolymer phase, the polymerizations being conducted in the presence of an olefin polymerization catalyst and the molecular weight of at least one of the homopolymer phase and the copolymer phase being controlled to provide said intrinsic viscosity ratio (Claims 6 and 7).

3.2 More specifically, D1 discloses in Example 1 (Sample 2) a block copolymer having a melt flow rate of 4.8 dg/min (i.e. 4.8 g/10 min) and a copolymer fraction of 26.2 weight % (i.e. resulting in an homopolymer fraction of 74.8 weight %) having a content of 35.1 weight % of ethylene. D1 further discloses in its Example 1

(Sample 7) a block copolymer having a melt flow rate of 2.0 g/10 min and a copolymer fraction of 27.0 weight % having a content of 29.6 weight % of ethylene.

- 3.3 It thus follows from these considerations that the block copolymers of Samples 2 and 7 of Example 1 of D1 meet the requirements set in out Claim 1 of the main request in terms of melt flow rate, of amount of homopolymer (component A), of amount of copolymer (component B) and of amount of ethylene in the copolymer component B for the claimed block copolymer.
- 3.4 While Claim 1 is drafted as a product-by-process claim, it is established case law of the Boards of Appeal, that process features can only contribute to the novelty of a product claim insofar as they give rise to a distinct and identifiable characteristic of the product.
- 3.5 In decision T 205/83, (OJ EPO 1985, 363; Reasons 3.2.1) this concept was developed by stating that "to establish novelty [of the polymeric product of a process], it will be necessary to provide evidence that modification of the process parameters results in other products" and by pointing out that such evidence may be constituted by "conclusive considerations which accord with the general state of the art" or by demonstrating "distinct differences in the products' properties", because "differences in the properties of products indicate a structural modification."
- 3.6 In that respect, the Appellant has submitted that D1 does not disclose either the intrinsic viscosity in tetralin at 135°C of the component B or the ratio of

the intrinsic viscosity (in tetralin at 135°C) of component B to the intrinsic viscosity of component A (in tetralin at 135°C) before melt-kneading, and that these process parameters would characterize the claimed block copolymer.

- 3.7 In this connection it is however noted by the Board that the melt-kneading step can be conducted in presence of a peroxide (cf. patent in suit, Examples 1 to 5; page 3, lines 43 to 45), i.e. resulting in a visbreaking step which will inevitably have the effect of breaking the polymer chains of the block copolymer and therefore the effect of modifying the intrinsic viscosities of the components A and B and ratio thereof. In the absence of evidence of the contrary from the side of the Appellant and in accordance with the principles set out in T 205/83, the Board can only come to the conclusion that the block copolymer does not exhibit any "fingerprints" of the values of the intrinsic viscosities of the components A and B and ratio thereof before visbreaking.
- 3.8 Consequently, the claimed block copolymer must be regarded as being characterized only by its melt flow rate (from 0.5 to 10 g/10 min), by its content of component A (60 to 75 wt%), by its content of component B (25 to 40%), and by the content of ethylene in component B (20 to 50 wt%).
- 3.9 Since as mentioned above in point 3.2, the block copolymers disclosed in Samples 2 and 7 of Example 1 of D1 exhibit all these characteristics, the subject matter of Claim 1 lacks novelty over document D1 (Article 54 EPC).

4. In view of the fact that the subject-matter of Claim 1 is not patentable, the Main Request must fall since a request can only be decided as a whole. Consequently, any further consideration of other contentious issues (i.e. Article 83 EPC) is not necessary.

*Auxiliary request A3*

5. *Wording of Claim 1*

- 5.1 As indicated above in Section VII (ii.1), the Respondent had no objection either under Article 123 EPC or Article 84 EPC against Claim 1 of the auxiliary request A3.

- 5.2 Since Claim 1 is a mere reformulation of Claim 1 of the Main Request in a process claim, the Board is also satisfied that it complies with the requirements of Articles 84, 123(2) and 123(3) EPC.

6. *Preliminary remarks*

- 6.1 The Appellant has contested (cf. Section VII (ii.3.b.1 above) that reference be made to the document D7 when assessing the novelty of the claimed subject-matter, since this document was post-published.

- 6.2 While it is true that document D7, which claims as its earliest priority that of the Japanese patent application JP 305292/95 of 24 November 1995, and which has been published on 9 September 1998 i.e. after the priority date of the patent in suit (16 September 1992), cannot belong to the state of the art according either



to Article 54(2) or Article 54(3)(4) EPC, it is evident, in the Board's view, that document D7 has only been used by the Appellant as an experimental report in order to support its line of argument for the determination of the intrinsic viscosities in tetralin at 135°C of the copolymers of D1.

6.3 Taking into account that document D7 has been filed during the procedure before the Opposition Division, and, that, therefore, the Appellant has had ample time to consider it, the Board sees no reason to disregard document D7 presented as an experimental report.

7. *Sufficiency of disclosure*

7.1 Claim 1 is to be construed as implying that it is essential for the obtaining of the block copolymer to carry out a melt-kneading step.

7.2 The Respondent has objected that Claim 1 does not comply with Article 83 EPC, since it does not refer to the use of peroxide in the melt-kneading step.

7.3 This argument, however, is in the Board's view rather associated with Article 84 EPC read in combination with Rule 29(1)(a) EPC than with the sufficiency of disclosure, i.e. with the question as to whether the patent specification provides sufficient information to enable a person skilled in the art to carry out the invention.

7.4 Nevertheless, in order to support its objection, the Respondent has referred to the table entitled "Determination of melt flows for examples of invention

in EP 0 588 581 B1", annexed to its letter of 6 August 2004, which, in its opinion, showed that the melt flow rate of the block copolymers disclosed in the Examples 1 to 5 of the patent in suit was well below 0.5 g/ 10 min before melt-kneading, and that therefore a visbreaking step (i.e. melt-kneading in presence of a peroxide) was necessary to obtain a block copolymer having a melt flow rate in the claimed range.

- 7.5 In that respect, the Board notes, however, that the determination of the melt flow rates of the block copolymers of Examples 1 to 5 of the patent in suit before melt-kneading made by the Respondent is based on the assumption that the same relationship exists between the intrinsic viscosity in tetralin and the melt flow rate of the block copolymer according to the patent in suit as the one deduced by the Respondent for the block copolymers exemplified in document D7 and illustrated by Figure 1 annexed to the letter of 6 August 2004.
- 7.6 It thus follows, in the Board's view, that a prerequisite for the line of argument of the Respondent, is that it is established that the same relationship between intrinsic viscosity and melt flow rate is valid for both the block copolymers of D7 and those of the patent in suit.
- 7.7 This, however, presupposes that the block copolymers exemplified in D7 are structurally the same, i.e. not merely similar, as those of the Examples 1 to 5 of the patent in suit. In that respect, while D7 requires that the xylene soluble fraction at 20°C of the copolymer fraction of the block copolymers be not less than 80

wt.% and preferably not less than 85 wt.% (page 4, lines 38-45), and while the block copolymers of Examples 1 to 14 of D7 indeed exhibit values of such xylene soluble fraction lying between 86 and 92 wt.%, it can be deduced from the values given in Table 1 of the patent in suit that the xylene soluble fraction of the copolymer component in the block copolymers of Examples 1 to 5 of the patent in suit is between 51 wt.% (Example 5) and 77% (Example 2), i.e. well below that of the examples of D7. Thus, the Board can only come to the conclusion that it is not established that the block copolymers exemplified in the patent in suit would inevitably follow the same relationship between intrinsic viscosity and melt flow rate as those exemplified in D7.

7.8 Even if it were, and if the melt flow rate of the block copolymers disclosed in Examples 1 to 5 of the patent in suit would indeed have been below 0.5 g/10 min, so that it would be necessary, in the Respondent's view to carry out a visbreaking step, it is evident that Claim 1, interpreted in the light of the description of the patent in suit, does not exclude the presence of a peroxide component during the melt-kneading step, since the patent specification clearly indicates (page 3, lines 43 to 45) that the melt kneading step may be carried out by a conventional method in the presence (as made in the Examples 1 to 5 of the patent in suit) or in the absence of a peroxide.

7.9 This has for its consequence not only that the presence of a peroxide component in the melt kneading step must be regarded as an optional feature of the claimed process, but moreover that the description of the

patent in suit provides sufficient information (cf. Examples 1 to 5; page 3, lines 43 to 45), even in the circumstances relied on by the Respondent, to enable a person skilled in the art to carry out the invention.

7.10 It thus follows from the above that it has not been shown to the satisfaction of the Board that there is a deficiency in the patent in suit contrary to Article 83 EPC. Consequently, the objection under Article 83 EPC raised by the Respondent cannot succeed.

## 8. *Novelty*

8.1 As indicated above under point 5.2, Claim 1 results from a reformulation of Claim 1 of the Main Request as a process claim.

8.2 This implies that process characteristics which have been disregarded when assessing the novelty of the claimed block copolymer according to Claim 1 of the Main Request, might become relevant for distinguishing the claimed process from D1.

8.3 In that respect, while the Appellant has conceded that Example 1 of D1 disclosed all the features of the claimed process except the values of the intrinsic viscosity in tetralin at 135°C of the component B and the ratio of the intrinsic viscosity in tetralin at 135°C of the component B to that of the component A, the Respondent has submitted that the block copolymers of Sample 2 and Sample 7 of Example 1 of D1 met the requirements set out in Claim 1 for the intrinsic viscosity of component B and the ratio between the intrinsic viscosities of components A and B, and it has

therefore concluded that these specific examples were novelty destroying for the subject-matter of Claim 1.

8.4 In that context, the Board notes firstly that D1 contains no explicit disclosure of the intrinsic viscosities of the components A and B in tetralin at 135°C of the Samples 2 and 7, let alone of the ratio of these viscosities. Secondly, while D1 states that the intrinsic viscosities of the components A and B are determined in decalin at 135°C (page 3, lines 7 to 24), it does not even disclose the values of the intrinsic viscosities of the components A and B of Samples 2 and 7 according to this method, but only mentions the ratios (Table I) of the intrinsic viscosity in decalin at 135°C of the component B to that of component A of the Samples 2 and 7 (i.e. 1.2 and 1.3, respectively), which have been calculated according to the formula set out at page 6, lines 1 to 13 (cf. above Section VII (ii.3.a.2)).

8.5 The Board further notes that the line of argument of the Respondent, which supports its objection of lack of novelty, is based on the following assumptions:

(i) its having been established that the ratio of the intrinsic viscosity of the component B to that of A for the Samples 2 and 7 of Example 1 of D1 remains the same (i.e. 1.2 and 1.3 respectively) when using tetralin instead of decalin for the determination of the intrinsic viscosity at 135°C;

(ii) its having been established that the melt flow rate of component B of each Sample 2 and 7 is to be calculated using the formula mentioned in Section VII

(ii.3.a.6) above from the respective melt flow rate of the component A thereof and from the respective melt flow rate of each block copolymer; and

(iii) its having been established that the intrinsic viscosity in tetralin at 135°C of component B of each Sample 2 and 7 is deducible from the respective melt flow rate of the component B by interpolation from the graph plotting the intrinsic viscosity of the component B of the copolymers 1 to 12, and 14 of D7 (cf. Table C and corresponding graph annexed to the letter of 6 August 2004).

8.6 Consequently, the validity of the objection of lack of novelty rests exclusively on the validity of assumptions made by the Respondent. In such a case, the concept of balance of probability cannot be applied for the assessment of the validity of each assumption, but it must cede to a stricter criterion close to absolute conviction; in other words, there should be a degree of certainty which is beyond all reasonable doubt.

8.7 It must then be decided whether the validity of each assumption can be established under this strict criterion:

8.7.1 Concerning assumption (i):

(a) The Respondent has argued that document D3 discloses that there is a linear interpolation between intrinsic viscosities determined in tetralin at 135°C and intrinsic viscosities determined in decalin at 135°C for ethylene/propylene copolymers (EP).

(b) The Respondent has further submitted (cf. Table A annexed to the letter of 6 August 2004) that, if one applies the formula set out on page 6 of D1 for determining ratio of the intrinsic viscosity (in decalin at 135°C) of the component B to that of the component A for calculating the intrinsic viscosity ratio (in decalin at 135°C) of components A and B of the block copolymers of the Examples 1 to 14 of D7, one comes practically to the same values as the ones respectively given for the ratio of the intrinsic viscosities in tetralin at 135°C for the block copolymers of Examples 1 to 14 of D7.

(c) Thus, in the Respondent's view, it would follow from these considerations, that the ratio of the intrinsic viscosity of the components B to that of the component A remains the same, independently of the fact that the intrinsic viscosities have been determined in decalin or in tetralin at 135°C, and that therefore, the ratio indicated for Sample 2 and 7 (in decalin) in Table 1 of D1 will remain the same for viscosities determined in tetralin.

(d) In the Board's view, however, neither D3 nor the calculation made in respect of the Examples 1 to 14 of document D7 allows one to conclude with a degree of certainty which is beyond all reasonable doubt that this ratio remains inevitably the same for the Samples 2 and 7 of Example 1 of D1 for the following reasons:

(d.1) Firstly, D3 merely indicates that the data **suggest** a linear interpolation between the polyethylene (PE) and the polypropylene (PP) results in decalin and

tetralin at 135°C should be a good approximation in which all EP copolymers, crystalline or not can be accommodated (page 755, lines 30-33), and further does not state that there is an identical conversion factor for transforming the intrinsic viscosities of the homopolymer fraction (PP) in decalin to intrinsic viscosities in tetralin as for converting the intrinsic viscosities in decalin of the EP copolymer into intrinsic viscosities in tetralin, so that it cannot be ascertained that these conversion factors will cancel when calculating the ratio of the viscosities in decalin, or therefore that the ratio obtained in decalin would not differ from the ratio in tetralin;

(d.2) secondly, while the relationship between molecular weight and intrinsic viscosities either in decalin or tetralin at 135°C for ethylene propylene copolymers having an ethylene content between 60 and 70 mole% (cf. Fig.11 on page 752 (decalin), Sample 1 (decalin) and Sample 5 (tetralin) in Table VI on page 753) would lead to a conversion factor of 1.29 (i.e.  $4.07/3.15$ ) or 1.20 ( $3.8/3.15$ ), Table VII would indicate a conversion factor of 1.13 for an ethylene propylene copolymer (ethylene content not given), so that it cannot be ascertained from D3 which conversion factor, if any, should be used for Samples 2 and 7 of Example 1 of D1 which exhibit an ethylene content of 44.9 mole % (35.1 wt.%) and of 38.6 mole% (29.6 wt%) of the copolymer fraction (component B), respectively; and

(d.3) thirdly, although it can be accepted that there is some correlation between the intrinsic viscosity ratio in decalin calculated from the formula set out on page 6 of D1 and the intrinsic viscosity ratio in



tetralin for the block copolymers of Examples 1 to 14, this only shows that, **for the copolymers exemplified in D7**, the ratio of the intrinsic viscosity remains practically the same independently of the use of tetralin or decalin. This conclusion can only reciprocally apply to the block copolymers of Sample 2 and 7 of Example 1 of D1, provided it has been established that the block copolymers exemplified in D7 are structurally the same, i.e. not merely similar to those of the Samples 2 and 7 of the Example 1 of D1. This is, however, not the case, since, while D7 requires that the xylene soluble fraction at 20°C of the copolymer fraction of the block copolymers be not less than 80 wt.% and preferably not less than 85 wt.%, and while the block copolymers of Examples 1 to 14 of D7 indeed exhibit values of such xylene soluble fraction lying between 86 and 92 wt.%, D1 is totally silent on the xylene soluble fraction at 20°C of the copolymer fraction.

8.7.2 Concerning assumption (ii):

(a) In that respect, the Respondent has submitted that the melt flow rate of component A of Samples 2 and 7 can be determined by using the formula set out at page 6 of D1 since the melt flow rate of the block copolymer and the weight fractions of components A and B of these samples are disclosed in Table 1 of D1. It has further argued that the calculation method for determining the melt flow rate of the component B can be deduced from document D4, and it has relied on the two last lines of page 1652 thereof, which point out that "a 3.4 power dependence of melt viscosity on molecular weight has been predicted, also, that MFR and

viscosity are inversely related". It thus concluded that the melt flow rate of the component B is to be calculated by the formula as indicated above in Section VII (ii.3.a.6). It further stated that, in any case, this relationship was well known to the person skilled in the art, and it had verified that the melt flow rates of the copolymers of Examples 1 to 14 of D7 complied with this formula.

(b) In this connection, it is however, noted by the Board,

(b.1) firstly, that document D4 is only concerned with the relationship between melt flow rate and either the intrinsic viscosity measured in 1,2,4- trichlorobenzene at 135°C or in decalin at 135°C for polypropylene homopolymers (page 1651; Introduction and Experimental) and, hence, that D4 is absolutely not concerned with block copolymers as those of Samples 2 and 7 of Example 1 of D1;

(b.2) secondly, that, while it is correct, as submitted by the Respondent, that D4 at page 1652 refers to a 3.4 power dependence of melt viscosity on molecular weight, this is made in the specific context of D4 (polypropylene homopolymer), and that no evidence has been provided by the Respondent that this rule will apply to the block copolymers of D1,

(b.3) thirdly, that, even if the melt flow rates of the block copolymers of the examples of D7 effectively comply with the formula referred above in Section VII (ii.3.a.6), this will not reciprocally establish that the melt flow rates of the block copolymers of Samples

2 and 7 of Example 1 of D1 equally comply with it for the same reasons as indicated in paragraph 8.7.1 (d.3) above;

and,

(b.4) fourthly that the further submission of the Respondent that the relationship and its application to block copolymers such as those disclosed in D1 belong to the general knowledge of the skilled person is not supported by appropriate evidence (cf. T 766/91 of 29 September 1993; not published in OJ EPO; Reasons point 8.1).

(c) Thus, the Board can only come to the conclusion that the Respondent is far from having demonstrated with a degree of certainty beyond any reasonable doubt that the formula referred above in Section VII (ii.3.a.6) inevitably applies to the Samples 2 and 7 of Example 1 of D1 and, hence, that the values indicated in Table B annexed to the letter of 6 August 2004 for the melt flow rates of the component B of the Samples 2 and 7 of Example 1 of D1 (i.e. 3.17 and 1.7) indeed represent the actual values of this parameter for these block copolymers.

#### 8.7.3 Concerning assumption (iii):

(a) The Respondent has submitted that the value of the intrinsic viscosity in tetralin of the component B of Sample 2 and 7 is to be determined by interpolation from the graph plotting the intrinsic viscosity of the component B of the copolymers 1 to 12, and 14 of D7.

(b) In the Board's view, the fact that a specific relationship could have been deduced for the copolymers 1 to 12 and 14 of D7 between the intrinsic viscosity of the block B and its melt flow rate, cannot reciprocally establish for the same reasons as indicated in paragraph 8.7.1 (d.3) above that the block copolymers of Samples 2 and 7 would inevitably follow the same relationship between melt flow rates and intrinsic viscosity.

(c) This reasonable doubt as to whether any relationship between the intrinsic viscosity in tetralin and melt flow rate observed for the block copolymers of D7 could be applied to the block copolymers of D1, is further consolidated by the comparison between the calculation of the ratio of the intrinsic viscosities in decalin in D1 using the formula set out on page 6 of D1 and the calculation of the same ratio using the formula set out at page 3 of D1 for calculating the intrinsic viscosity in decalin of the component B, which shows that there should be a power dependence of the intrinsic viscosity of the block copolymers of D1 on their melt flow rate (i.e.  $[\eta]_{AB}/[\eta]_A$  must be equal to  $(MFR_A/MFR_{AB})^{0.213}$ ), while the relationship shown in Figure 1 annexed to the letter of 6 August 2004 for the block copolymers exemplified in D7 shows that the intrinsic viscosity thereof depends on the natural logarithm of their melt flow rate.

9. It thus follows from the above that the Board can only come to the conclusion that the prerequisite set out in paragraph 8.6 above for the validity of the objection of lack of novelty raised by the Respondent has not been fulfilled, and that it has not been unambiguously

shown by the Respondent that the block copolymers of Samples 2 and 7 of Example 1 of D1 inevitably meet the requirements set out in Claim 1 for the intrinsic viscosity of the component B and the ratio of the intrinsic viscosity of the component B to that of the component A before melt-kneading.

9.1 Consequently, the subject-matter of Claim 1 must be considered as novel over the cited prior art referred to by the Respondent (Art. 54 EPC).

10. The Opposition Division revoked the patent on the grounds of lack of novelty (main request) and on the ground of insufficient disclosure (auxiliary request) Since the grounds which led to the revocation of the patent have been overcome by the auxiliary request A3, the decision under appeal must be set aside.

11. *Remittal*

11.1 As indicated above in point 10, the Opposition Division revoked the patent on the ground of lack of novelty and insufficiency of disclosure, and as a consequence did not express its opinion regarding the ground of lack of inventive step.

11.2 Having regard to the requests of both the Parties for remittal to the first instance and in order not to deprive them of the possibility to be heard by two instances, the Board considers it appropriate to make use of its discretionary power under Article 111(1) EPC and to remit the case to the first instance for further prosecution.

**Order**

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

1. The decision under appeal is set aside.
2. The main request of the Appellant is refused.
3. The case is remitted to the first instance for examination of inventive step on the basis of auxiliary request A3 filed with the letter dated 9 August 2002.

The Registrar:

The Chairman:

E. Görgmaier

R. Young