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Datasheet for the decision of 21 June 2007

Case Number: T 0315/04 - 3.3.03

Application Number: 96928015.5

Publication Number: 0842208

IPC: C08G 61/10

Language of the proceedings: EN

Title of invention:
2,7-Aryl-9-substituted fluorenes and 9-substituted fluorene oligomers and polymers

Patentee:
Sumitomo Chemical Company, Limited

Opponent:
Merck KGaA

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84, 123(2)

Keyword:
"Novelty - implicit disclosure - (no)"
"Inventive step - (yes)"
"Clarity - (yes)"
"Amendments - added subject-matter - (no)"

Decisions cited:
T 0793/93

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0315/04 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 21 June 2007

Appellant (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office dated 20 November 2003 and posted 18 December 2003 concerning maintenance of the European Patent No. 0842208 in amended form.

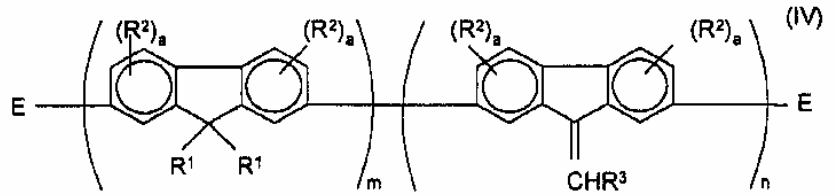
Composition of the Board:

Chairman: R. Young
Members: M. C. Gordon
E. Dufrasne

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 0 842 208 in the name of The Dow Chemical Company, later assigned to Sumitomo Chemical Company, Limited, in respect of European patent application No. 96928015.5, filed on 26 July 1996 as international application No. PCT/US96/12290, published as WO 97/05184 on 13 February 1997, and claiming priority of two US patent applications no. 08/508 942 and 08/508 943, both dated 28 July 1995, was announced on 17 May 2000 (Bulletin 2000/20) on the basis of 52 claims, claim 1 of which read as follows:

"1. A compound of the formula



wherein:
E is independently in each occurrence hydrogen, halogen, aryl or aryl substituted with a reactive group capable of undergoing chain extension or crosslinking or a trialkylsiloxy moiety;
R^1 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl containing one or more heteroatoms selected from S, N, O, P and Si; C_{4-16} hydrocarbyl carbonyloxy, or (C_{9-16} aryl)trialkylsiloxy, or both R^1 may form, with the 9-carbon of the fluorene ring, a C_{5-20} ring structure or a C_{4-20} ring structure containing one or more heteroatoms selected from S, N and O;

R^2 is independently in each occurrence C_{1-20} hydrocarbyl, C_{1-20} hydrocarbyloxy, C_{1-20} thioether, C_{1-20} hydrocarbyloxycarbonyl, C_{1-20} hydrocarbylcarbonyloxy, cyano, thiocyano, C_{6-12} thioaryl, C_{1-20} alkylthio or hydroxy;
R^3 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl substituted with di(C_{1-20} alkyl)amino, C_{1-20} hydrocarbyloxy, tri(C_{1-10} alkyl)siloxy or C_{1-20} hydrocarbyl;
a is independently in each occurrence 0 or 1; and
m and n are 0 or non-negative numbers and the sum of n and m is at least 1
wherein the polymers have a polydispersity of less than 5."

Claims 2 to 36 were dependent claims directed to preferred embodiments of the compound of claim 1.

Claims 37 was directed to a polymer based on a compound of any one of claims 1 to 34. Claim 38, which was dependent on claim 37 was in the format "product by process".

Independent claims 39 and 40 were directed to (different) processes for preparing a 9-substituted fluorine oligomer or polymer. Neither of these claims was directed to the process steps specified in claim 38 (see above). Dependent claims 41-48 were directed to preferred embodiments of the process of claims 39 and 40.

Claim 49 was directed to a 9-substituted fluorene polymer obtainable by a process as defined in claim 39.

Claims 50 and 51 were directed to a film and coating respectively of an oligomer or polymer as defined in any of claims 4 to 13, 17 to 38 and 49. Claim 52 was directed to a polymeric light-emitting diode comprising a film or coating as defined in claim 50 or claim 51.

II. Oppositions against the grant of the patent were filed on:
15 February 2001 by Covion Organic Semiconductors GmbH, later Merck KGaA (OI) and on
19 February 2001 by Cambridge Display Technology Limited (OII).

The grounds pursuant to Article 100(a) to (c) EPC were invoked.

Both opponents requested revocation of the patent in its entirety.

The oppositions were supported, *inter alia* by the following document:

D12: Fukuda, Masahiko *et al*; J. Polymer Science: Part A: Polymer Chemistry, Vol. 31, pp. 2465-2471 (1993);

III. By letter dated 2 January 2002 and received 3 January 2002 Cambridge Display Technology (OII) withdrew its opposition.

IV. In a decision announced orally on 20 November 2003 and issued in writing on 18 December 2003 the opposition division held that the patent could be maintained in amended form on the basis of the fourth auxiliary request, consisting of 81 claims and filed during oral

proceedings before the division. This request contained three independent product claims 1, 2 and 31, two independent process claims 56 and 57 and three independent article claims 79-81.

Claims 1 and 2 were each directed to "a compound" of formula IV according to claim 1 of the patent as granted (see section I above) wherein, however, the possibility that E could be hydrogen had been deleted. According to claim 1, furthermore, the indices "m" and "n" were defined as follows:

"m and n are 0 or non-negative numbers, at least one of m and n is a non-negative number and the sum of n and m is at least 10".

The definition of m and n in claim 2 differed from claim 1 in specifying in the final phrase:
"the sum of n and m is greater than 1".

Claim 31 was directed to a "polymer", with a weight average molecular weight of 20,000 Daltons or greater and a polydispersity of less than 5.0, **based on** a 9-substituted fluorene compound of formula IV (see section I above - board's emphasis), also with the possibility that E could be hydrogen having been deleted. Furthermore, the indices "m" and "n" were defined according to claim 31 as follows:

"m is 1 and n is 0 or m is 0 and n is 1".

Claims 3 to 30 were directed to preferred embodiments of the subject matter of claims 1 and/or 2 and claims 32 to 55 were directed to preferred embodiments

of the subject matter of claim 31. Independent process claims 56 and 57 corresponded to claims 39 and 40 as granted (see section I above). Claim 56 was however further limited by relating to a process for preparing the compounds defined in claim 1 or claim 2. Claims 58-78 were dependent process claims. Claims 79 and 80 were directed to a film of an oligomer or polymer or a coating of a polymer respectively as defined in claims 1-55. Claim 81 was directed to a polymeric light-emitting diode comprising a film or coating as defined in claim 79 or 80.

The decision held that:

(a) The claims of the fourth auxiliary request met the requirements of Article 123(2) EPC.

(b) With regard to novelty, it was held that the subject matter of claims 1, 2 and 31 was distinguished from the poly-9,9-dihexylfluorene (PDHF) disclosed in D12 in that the claimed compounds contained halogen, aryl- or aryl-substituted end groups ("hydrogen" having been deleted as compared to the main and first to third auxiliary requests).

From the discussion in the decision with respect to the main and first to third auxiliary requests it is apparent that the opposition division considered that the degree of polymerisation specified in the respective claims 1 of these requests (the sum of m+n being at least 10) did not provide a distinction with respect to he disclosure of D12. The reason was that the degree

of polymerisation of the polymers of D12 (which values had been calculated by the patent proprietor from the number average molecular weight M_n and referred to in the response to the notice of opposition, filed with letter dated 3 December 2001) could only be considered as average values. They had nothing in common with a value counting precisely the number of monomer units (such as m+n being at least 10). Thus according to a more or less broad molecular weight distribution one would automatically obtain higher and lower degrees of polymerisation values than those calculated. Accordingly even at a rather narrow molecular weight distribution a dioctyl 9,9-substituted fluorene (D12, Table II, degree of polymerisation = 8.4) would automatically comprise polymer chains having a degree of polymerisation of greater than 10. Since D12 clearly disclosed a mixture of materials (acknowledged by the patent proprietor) the "single" compound recited in claim 1 was regarded as being present in the mixture of D12.

(c) With regard to inventive step, it was held that since the features distinguishing the subject matter of claims 1, 2 and 31 from the prior art D12 did not appear to result in any special effects the objective technical problem to be solved with regard to D12 could only be formulated as to provide further compounds having a similar quality to those described in D12. None of the cited documents suggested to modify the fluorene polymers with halogen- aryl- or aryl-substituted end groups. It was concluded that the claimed

solution could not be derived from an objective assessment of the prior art. Therefore no objection under Art. 56 EPC could be raised regarding the subject matter of independent claims 1, 2 and 31. The patentability of the subject matter of these claims resulted in the patentability of the subject matter of the remaining claims.

(d) Accordingly it was held that the patent could be maintained in amended form on the basis of the fourth auxiliary request.

V. An appeal against this decision was filed on 27 February 2004 by the opponent, the requisite fee being paid on the same day.

VI. The statement of grounds of appeal was filed on 28 April 2004.

(a) The appellant requested that the decision of the opposition division be set aside and that the patent in suit be revoked in its entirety. As an auxiliary measure oral proceedings were requested.

(b) The conclusion of the decision under appeal that the subject matter of claims 1 and 31 was distinguished from the disclosure of D12 by the definition of the end groups "E" was disputed.

The definition of "E" also encompassed "aryl". This term was not further defined and encompassed the fluorene residue itself. This had the consequence that the definition of the end group

in the claims 1 and 31 did not distinguish the subject matter thereof from the polymers of D12.

VII. The patent proprietor - now the respondent - replied with a letter dated 26 August 2004.

(c) It was requested that the appeal be dismissed and that the patent be maintained in accordance with the "Opposition Fourth Auxiliary Request". Three further sets of claims forming first to third auxiliary requests were submitted. Oral proceedings were requested for the case that the board would not allow the main request.

(d) With respect to claim 1 of the main request it was submitted that there was no suggestion in the patent that the aryl group represented by E could be either a 9-disubstituted fluorenyl or a 9-hydrocarbyldienyl fluorenyl of the relevant formula. It was implicit in the definition of E that it was neither of these groups. Had it been so then the value of the index n or m would have increased and E in the relevant formula would be hydrogen and hence not within the scope of the claim.

(e) With respect to D12 it was submitted that this document provided no disclosure of polymers having both a polydispersity less than 5 and a degree of polymerisation (i.e. the sum of n and m) of at least 10.

VIII. In a letter dated 27 January 2005 the appellant submitted that the feature identified by the opposition division as conferring novelty to the subject matter of

claims 1, 2 and 31, namely the presence of certain end groups was not specified in claims 1 or 31.

IX. The board issued a communication on 12 October 2006 in which the board expressed its preliminary provisional opinion on the case.

(f) With respect to Article 123(2) EPC *inter alia* it was observed that claim 1 permitted either of the indices m and n to be 0. Claim 1 of the application as filed however defined these indices as being "non-negative numbers".

Analogous objections were raised with respect to claims 2 and 31.

Further with respect to claim 2 it was observed that no explicit basis could be found for the feature that the sum of m and n be greater than 1.

(g) With regard to Article 84 EPC it was objected that the wording "substantially all" in claims 1, 2 and 31 did not provide a precise definition of the subject matter claimed and hence rendered the scope of the claims unclear.

X. In a letter dated 19 December 2006 the appellant indicated agreement with the views expressed by the board.

XI. Together with a letter dated 9th February 2007 the respondent made further submissions.

XII. On 5 April 2007 the board issued a summons to attend oral proceedings.

XIII. In a letter dated 16 April 2007 the respondent submitted that an error had been made in the submission of 9th February. A corrected version of the submission was provided.

XIV. Together with a letter dated 18 May 2007 the respondent submitted two new sets of claims forming a first and fifth auxiliary requests respectively. The existing first, second and third auxiliary requests were designated the second, third and fourth auxiliary requests respectively. Correspondingly amended copies of the first to fifth auxiliary requests were submitted.

XV. In a letter dated and received on 15 June 2007 the respondent announced that it would be accompanied by three employees at the oral proceedings.

XVI. Oral proceedings were held on 21 June 2007.

(h) With respect to Article 123(2) EPC and the definition of the indices m and n the respondent submitted that the term "non-negative numbers" as employed in original claim 1 encompassed 0. Further, it was apparent from page 1 of the application as filed that the invention was also directed to homopolymers. In response to an observation by the appellant that this interpretation meant that both m and n could be 0 the respondent drew attention to the requirement that the sum of m and n according to claim 1 be at least 10.

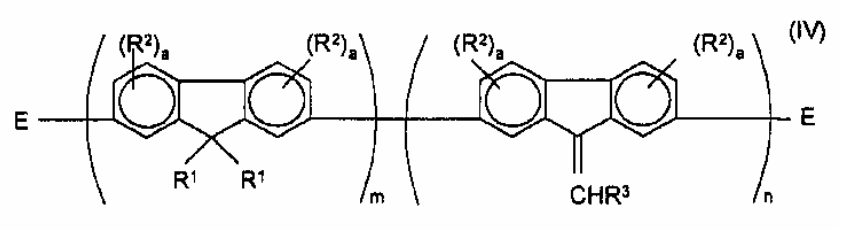
(i) In respect of claim 2 and the feature that the sum of n and m was greater than 1 the respondent submitted that the application related to polymers and oligomers.

(j) With respect to Article 123(2) in connection with claim 31 the appellant submitted that this claim only defined that the polymer be **based on** (board's emphasis) the specified fluorene units but, in contrast to claims 1 and 2 permitted the presence of other monomer units. Hence this claim was of broader scope than claim 1. The respondent disputed this.

(k) With respect to Article 84 EPC and the term "substantially all" (see section IX.(b) above) the respondent submitted that the term was clear. This position was disputed by the appellant.

(l) A new main request consisting of 56 claims was submitted. The new main request contained two independent product claims, claims 1 and 2 which read as follows:

"1. A compound of the formula:

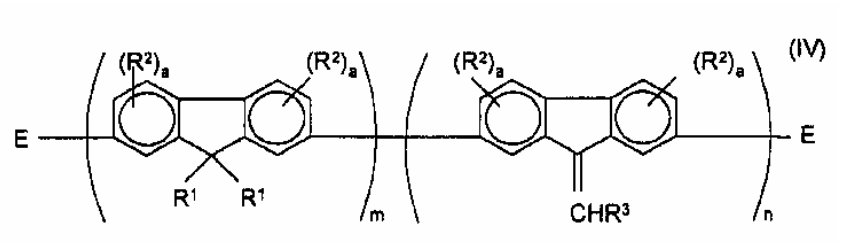


wherein:

E is independently in each occurrence

halogen, aryl or aryl substituted with a reactive group capable of undergoing chain extension or crosslinking or a trialkylsiloxy moiety;
R^1 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl containing one or more heteroatoms selected from S, N, O, P and Si; C_{4-16} hydrocarbyl carbonyloxy, or (C_{9-16} aryl)trialkylsiloxy, or both R^1 may form, with the 9-carbon of the fluorene ring, a C_{5-10} aliphatic ring structure or a C_{4-20} ring structure containing one or more heteroatoms selected from S, N and O;
R^2 is independently in each occurrence C_{1-20} hydrocarbyl, C_{1-20} hydrocarbyloxy, C_{1-20} thioether, C_{1-20} hydrocarbyloxycarbonyl, C_{1-20} hydrocarbylcarbonyloxy, cyano, thiocyano, C_{6-12} thioaryl, C_{1-20} alkylthio or hydroxy;
R^3 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl substituted with di(C_{1-20} alkyl)amino, C_{1-20} hydrocarbyloxy, tri(C_{1-10} alkyl)siloxy or C_{1-20} hydrocarbyl;
a is independently in each occurrence 0 or 1; and
m and n are 0 or non-negative numbers and the sum of n and m is at least 10 and
wherein the polymers have a polydispersity of less than 5.

2. A compound of the formula:



wherein:

E is a phenolic, a cyanato-substituted phenyl or a benzocyclobutene moiety,
R^1 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl containing one or more heteroatoms selected from S, N, O, P and Si; C_{4-16} hydrocarbyl carbonyloxy, or (C_{9-16} aryl)trialkylsiloxy, or both R^1 may form, with the 9-carbon of the fluorene ring, a C_{5-20} ring structure or a C_{4-20} ring structure containing one or more heteroatoms selected from S, N and O;
R^2 is independently in each occurrence C_{1-20} hydrocarbyl, C_{1-20} hydrocarbyloxy, C_{1-20} thioether, C_{1-20} hydrocarbyloxycarbonyl, C_{1-20} hydrocarbylcarbonyloxy, cyano, thiocyano, C_{6-12} thioaryl, C_{1-20} alkylthio or hydroxy;
R^3 is independently in each occurrence C_{1-20} hydrocarbyl or C_{1-20} hydrocarbyl substituted with di(C_{1-20} alkyl)amino, C_{1-20} hydrocarbyloxy, tri(C_{1-10} alkyl)siloxy or C_{1-20} hydrocarbyl;
a is independently in each occurrence 0 or 1; and
m and n are 0 or non-negative numbers and the sum of n and m is greater than 1 and
wherein the polymers have a polydispersity of less than 5."

Claims 3 to 30 were directed to preferred embodiments of the compounds of claims 1 and/or 2. Claims 31 and 32 were directed to processes for preparing a 9-substituted fluorene oligomer or polymer, corresponding to claims 56 and 57 of the main request relied upon in the statement of grounds of appeal (corresponding to the fourth auxiliary request underlying the decision under appeal- see section IV above). Claims 33 to 53

were directed to preferred embodiments of the processes of claims 31 and 32. Claims 54 to 56 corresponded to claims 79 to 81 of the main request relied upon in the statement of grounds of appeal (corresponding to the fourth auxiliary request underlying the decision under appeal- see section IV above).

Claims 31 to 55 of the former fourth auxiliary request (see section IV above) had been deleted.

(m) The appellant stated that it had no objections pursuant to Articles 84 or 123(2) EPC to the newly formulated main request.

(n) The appellant submitted, however, that the subject matter of claim 1 was not novel with respect to the disclosure of D12.

(i) With regard to the end groups E it was submitted that these were defined as aryl, but were not further specified. Hence any aryl group was within the scope of this term including fluorene.

The respondent submitted that it was implicit in formula IV at page 4 of the patent that while the end groups could be similar to the main chain units they could not be identical. It was further submitted that it was entirely unreasonable to consider the E units as being identical to the repeating units.

(ii) With regard to the features that the sum of n and m was at least 10 and the polydispersity was less than 5 the appellant submitted that compounds having polydispersities in the required range were disclosed in D12, reference being made to Table II thereof. The degree of polymerisation (calculated from the M_n - see section IV.(b) above) was an average value as there was a distribution of molecular weights. Within the population of molecules having an average degree of polymerisation of 8 or 9, i.e. those having an average content of 8 or 9 repeating units there would - with a high degree of certainty - be some with the required sum of n and m being at least 10 and which were all linked via the 2 and 7 carbons, as required by the structural formulae (IV) in claims 1 and 2. With regard to the mode of linking, it was submitted that from the discussion of the NMR results at page 2469 of D12, and the statement in the "conclusion" at page 2471 thereof, it was apparent that the linkage in the compounds of D12 was mainly via the 2 and 7 carbons.

The respondent submitted that there was no disclosure in D12 of a molecule with 10 units all linked via the 2,7 carbons. It was impossible to ascertain, if, in a single molecule, all the units in the polymers of D12 were linked via the 2,7 carbons. It was considered unlikely that a polymer of D12

with the required degree of polymerisation would exhibit exclusively 2,7 linkages due to the high risk of crosslinking. It could be the case that as the chain length increased so did the extent of cross- and mis-linking. This however could not be known with certainty. It was submitted that if the polymer of D12 had been 2,7 linked then it would be expected to display the same behaviour as the products of the patent. However the data of examples 12 and 15 of the patent revealed large differences in the properties of polymers obtained by the process disclosed in D12 and those obtained by the methods employed in the patent.

XVII. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent no. 842 208 be revoked.

The respondent (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request (claims 1-56) filed at the oral proceedings or, in the alternative, of one of the auxiliary requests 1 to 5 filed with the letter dated 18 May 2007.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request - Article 123(2) EPC*

In view of the submissions made at the oral proceedings (see sections XVI.(a) and (b) above), the board is satisfied that the application as filed discloses both homo- and copolymers of either or both of the units specified in the formula in original claim 1. Therefore the definition of n and m as being 0 does not add subject matter.

Accordingly the objections raised pursuant to Article 123(2) EPC in the communication of the board (see section IX.(a) above) are waived.

In this connection it is noted that since this formulation was present in the patent as granted this wording cannot lead to an objection of lack of clarity pursuant to Article 84 EPC, since this is not one of the grounds pursuant to Art. 100 EPC upon which an opposition may be filed

No further objections in respect of Article 123(2) EPC were raised by the appellant. Nor has the board any objections of its own with respect to this Article.

Therefore the claims according to the main request meet the requirements of Article 123(2) EPC.

3. *Main request- Article 84 EPC*

The phrase "substantially all" objected to (see section IX.(b) above) has been deleted from the claims.

The objection raised in respect of the phrase "based on" in claim 31 (see section XVI.(c) above) no longer arises since this claim and the claims dependent upon

it have been deleted (see section XVI.(e), last sentence, above).

Accordingly the objections pursuant to Article 84 EPC have been overcome.

No further objections were raised under these provisions by the appellant. Nor has the board any additional objections of its own.

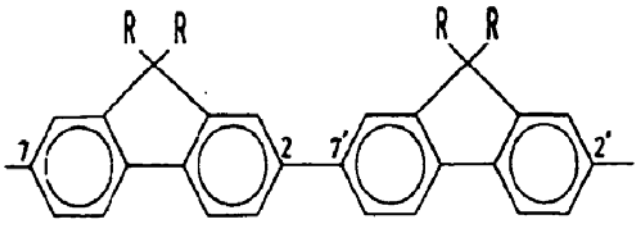
Accordingly the claims of the main request meet the requirements of Article 84 EPC.

4. *Main request - Article 54 EPC*

A novelty objection was maintained at the appeal stage in respect of the disclosure of D12 (see sections VI.(b) and XVI.(g) above).

4.1 D12 relates to the synthesis of polyfluorene derivatives, specifically poly-(9-alkylfluorene)s and poly-(9,9-dialkylfluorene)s.

The schematic molecular structure of the resulting polymers, as reported in figure 5 of D12 is:



D12 reports in the sections entitled "Experimental" and "Results and Discussion", the preparation and properties of polymers of 9,9-disubstituted fluorenes wherein the R groups are hexyl, octyl, decyl and

hexadecyl. The M_w, M_n and polydispersity (M_w/M_n) of the resulting polymers are recorded (Table II). From the M_n it is possible to calculate the degree of polymerisation (Dp), i.e. the number of repeat units in each chain. This information was submitted by the patent proprietor in its response to the notices of opposition (letter dated 3 December 2001, page 10, (see section IV.(b) above), and referred to by the patent proprietor in the response to the statement of grounds of appeal (see section VII.(c) above). This calculated value - the relevance and correctness of which was not challenged by the appellant - is reported in the following table the data of which are taken from the above referenced letter of the patent proprietor:

R	M_w	M_n	M_w/M_n	Dp
9,9-dihexyl	31400	4620	6.8	13.8
9,9-dioctyl	10700	3280	3.3	8.4
9,9-didecyl	9940	4020	2.5	9.0
9,9-dihexadecyl	15600	5160	3.0	8.4

4.2 *Claim 1*

The wording of claim 1 of the main request is reported in section XVI.(e) above. The compound according to claim 1 of the main request contains either or both of the defined fluorene moieties. The compound of claim 1 has end groups "E" which are specified as being *inter alia* "aryl". The groups in the 9,9 position can be *inter alia* C_{1-20} hydrocarbyl. The sum of n and m (the degree of polymerisation) is at least 10, and the polydispersity, defined in paragraph [0037] of the patent as M_w/M_n is less than 5. Therefore in the case that n is 0 the compound of claim 1 will have at least

10 repeating units of the 9,9 disubstituted variant and two end groups E.

It is a matter of consensus between the parties (see section XVI.(g).(ii) above) that the structural formula "IV" in claim 1 further requires that all the monomer units are linked via the 2 and 7 carbons of the fluorene moieties.

4.2.1 The polymers of D12 are disclosed as being chains of 9-alkyl or 9,9-dialkyl fluorenyl groups. According to the generalised formula disclosed in D12, reproduced above in section 4.1, these groups are also present at the terminals of the chains. Since these groups contain an (extended) aromatic ring system they fall within the scope of the term "aryl". The submissions of the respondent at the oral proceedings (See section XVI.(g).(i) above) that it was implicit in formula IV at page 4 of the patent that:

- while the end groups E could be similar to the main chain units they could not be identical;

- it was entirely unreasonable to consider the end groups E as being identical to the repeating units

are supported neither by the wording of the claim nor by any statement in the description of the patent in suit. Accordingly it must be concluded that, contrary to the submissions of the respondent, it is within the scope of the claim for the end groups E to be identical to the main chain groups. Accordingly the definition of the end groups E in claim 1 as "aryl" does not

distinguish the claimed subject matter from the polymers disclosed in D12.

4.2.2 With regard to the degree of polymerisation and the polydispersity of the polymers of 9,9-dialkyl substituted fluorenes of the examples of D12, reported in the table in section 4.1 above, it is apparent that there is no explicit, literal disclosure of a polymer having the combination of polydispersity and degree of polymerisation required by operative claim 1. The appellant has not alleged that there was any such explicit disclosure in D12.

4.2.3 The appellant has also provided no evidence that molecules having the required combination of degree of polymerisation, polydispersity and mode of linking are inevitably present in the compositions of D12.

4.2.4 The appellant has instead advanced arguments (see section XVI.(g).(ii) above) that within the population of molecules having an average content of 8 or 9 repeating units, i.e. the 9,9-dioctyl, 9,9-didecyl and 9,9-dihexadecyl analogues (see table in section 4.1 above) there would, **with a high degree of probability** (emphasis by the board) nevertheless be some molecules with the required degree of polymerisation of at least 10, and which were all linked via the 2,7 carbons.

(a) The case being made is thus that said features are implicitly disclosed in D12 to the extent that in carrying out the express literal disclosure and instructions of D12 subject matter falling within the terms of the claims of the patent in suit is the inevitable outcome.

(b) Under these circumstances, the "balance of probability" is not the appropriate standard. Rather, a stricter standard of proof, that of "beyond all reasonable doubt" needs to be applied. This means that if there is any reasonable doubt as to what may or may not be the result of carrying out the literal disclosure and instructions of a prior art document, i.e. if there remains a "grey area" then the case of anticipation based on that document must fail (see T 793/93, 27 September 1995, not published in the OJ EPO, section 2.1 of the reasons).

(c) While, due to the statistical nature of polymers, the possibility that within the products of D12 there will be some molecules which do fulfil the requirements of degree of polymerisation, polydispersity and mode of linking required by operative claim 1 cannot - beyond all reasonable doubt - be excluded, the converse is also true. In other words, it cannot be concluded - beyond all reasonable doubt - that such molecules will inevitably result from the process disclosed in D12. Thus there remains a doubt or "grey area" as to what the outcome of the process of D12 will be.

(d) The appellant has therefore failed to prove to the required standard of beyond all reasonable doubt its allegation that D12 implicitly discloses compounds having the combination of degree of polymerisation and polydispersity specified in operative claim 1.

4.2.5 Moreover, regarding the nature of the linking, as noted above, (section 4.2) operative claim 1 requires that all the monomer units are linked via the 2 and 7 carbon atoms. D12 states that the mode of linking is "mainly" in the 2,7 fashion ("Conclusion" of D12). In the view of the board, while the lower limit of the term "mainly" is uncertain, the upper limit is 100%. Therefore the term "mainly" encompasses the embodiment in which the units are exclusively 2,7 linked. However the term "mainly" is of undefined scope - at its lower end -and hence does not explicitly disclose the embodiment where all units are linked 2,7. Therefore the disclosure in D12 that the units are "mainly linked" by the 2 and 7 carbons does not anticipate the feature expressed by formula IV in operative claim 1 that the linking be exclusively in the 2,7 fashion.

4.2.6 The subject matter of claim 1 of the main request is therefore novel with respect to the disclosure of D12.

4.2.7 No further documents were cited by the appellant as anticipating the subject matter of claim 1 of the main request.

4.2.8 Accordingly the subject matter of claim 1 of the main request is novel (Article 54 EPC).

4.3 *Claim 2*

Claim 2 of the main request differs from claim 1 in that it is specified that the end groups are phenolic, a cyanato-substituted-phenyl or a benzocyclobutene moiety, and in that it is specified that the sum of n

and m , i.e. the degree of polymerisation is greater than 1.

The features relating to the mode of linking and the polydispersity are identical to claim 1.

4.3.1 As noted above in section 4.2.1 with respect to claim 1, the end groups of the polymers of D12 are either 9-monosubstituted or 9,9-disubstituted fluorenyl. The appellant has not alleged that the end groups of D12 fall within the scope defined for the end groups E as defined in claim 2 and the board is aware of no reason that would justify reaching a different conclusion.

4.3.2 With regard to the specified degree of polymerisation, polydispersity and mode of linking of the fluorene units, the conclusions reached with respect to claim 1 (see section 4.2, in particular 4.2.4 above), that D12 does not disclose polymers having these features apply also to claim 2.

4.3.3 Therefore it is concluded that the subject matter of claim 2 is novel with respect to the disclosure of D12. The subject matter of claims 3 to 30, which claims are dependent on claims 1 and/or 2 is accordingly also held to be novel.

4.4 *Independent process claims 31 and 32*

No objections were raised in respect of this subject matter by the appellant. Nor has the board any objections of its own.

Therefore the subject matter of claims 31 and 32 is held to be novel.

The subject matter of claims 33 to 53, which claims are dependent on claims 31 and 32 is accordingly also held to be novel.

4.5 *Claims 54 to 56*

No objections were raised in respect of this subject matter by the appellant. Nor has the board any objections of its own.

Indeed, since the polymers of claims 1 and 2 are novel, it follows that the films, and coatings prepared therefrom are also novel.

Therefore the subject matter of claims 54, 55 and 56 is novel.

4.6 The subject matter of all claims is therefore novel.

5. Since Article 54 EPC was the only ground invoked in the statement of grounds of appeal it follows that no objections have been raised under Article 56 EPC by the appellant. Nor has the board any objections of its own.

Consequently the subject matter of all claims is held to involve an inventive step in the sense of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the main request (claims 1 to 56) filed at the oral proceedings and after any necessary consequential amendment of the description.

The Registrar: The Chairman:

M. Kiehl R. Young