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**Datasheet for the decision
of 12 August 2010**

Case Number: T 1693/07 - 3.3.03

Application Number: 98939419.2

Publication Number: 1007582

IPC: C08G 69/06

Language of the proceedings: EN

Title of invention:

Process for preparing polyamides

Patentee:

INVISTA Technologies S.à.r.l.

Opponent:

RHODIA CHIMIE

Headword:

-

Relevant legal provisions:

EPC Art. 56

RPBA Art. 12(2), 13(1), 13(3)

Relevant legal provisions (EPC 1973):

-

Keyword:

"Inventive step - *ex post facto* analysis"

"Main request - allowable (yes)"

Decisions cited:

T 0506/95

Catchword:

-



Case Number: T 1693/07 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 12 August 2010

Appellant: RHODIA CHIMIE
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office dated
5 July 2007 and posted 2 August 2007 concerning
maintenance of European patent No. 1007582 in
amended form.

Composition of the Board:

Chairman: A. Däweritz
Members: M. C. Gordon
H. Preglau

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 1 007 582 with the title "Process for Preparing Polyamides" in the name of E.I. Du Pont de Nemours and Company in respect of European patent application No. 98939419.2, filed on 21 August 1998 as international application No. PCT/US98/17377, published as WO 99/10408 on 4 March 1999, and claiming a priority date of 28 August 1997 from US 60/057,731 was announced on 5 November 2003 (Bulletin 2003/45) on the basis of 28 claims.

Claims 1, 18, 22 and 27 were independent claims and read as follows:

1. A process for the preparation of polyamide prepolymers, possessing less than 7 wt. % of extractable impurities, comprising the steps of:

- (a) prepolymerizing a polyamidation precursor selected from the group consisting of a polyamidation monomer, a mixture of polyamidation monomers, and a mixture of polyamidation monomers and comonomers in a polyamidation reactor, in the presence of a flowing vapor phase for between 10-600 minutes at pressures between 1000 kPa (145 psia; 130.3 psig; 10 bar) and the system vapor pressure so that boiling occurs resulting in operation in a two phase (vapor phase/liquid phase) region to form a polyamide prepolymer;
- (b) flashing excess dissolved liquid water and reaction product volatiles into the vapor phase by passing the liquid prepolymer solution/vapor stream through a flasher stage that follows the reactor to let down the pressure to approximately 101 kPa (1 atmosphere) and to strip off the extractable impurities (as determined by methanol extraction: 1 g polymer to 5 ml methanol, 65°C, 16 hrs); and
- (c) passing the flasher effluent through less than 5 minutes holdup time in a separator at 101 kPa (1 atmosphere) that follows the flasher.

18. A process for the preparation of crystalline polyamide prepolymers, comprising crystallizing a polyamide prepolymer, possessing less than 7 wt. % impurities (as determined by methanol extraction: 1 g polymer to 5 ml methanol, 65°C, 16 hrs), and having a molecular weight between 3,000 and 10,000 isothermally at a temperature (Tc) within plus or minus 20°C of the temperature of maximum crystallization rate, provided that Tc is 30 or more degrees below the melting point of the polyamide prepolymer.

22. A process for the preparation of high molecular weight polyamide polymer comprising the steps of:

- (a) crystallizing a polyamide prepolymer according to the process of Claim 18 or Claim 21; and
- (b) solid state polymerizing the crystallized polyamide prepolymer, in the presence of an inert gas having a superficial gas velocity of 0.03 to 0.51 m/s (0.1 to 2 ft/sec.), and at a temperature of at least 1°C below the softening point of the crystallized polyamide prepolymer as indicated by DSC curves.

27. A process for solid phase processing and vapor phase extraction of impurities of nylon 6 polyamide polymers or their copolymers comprising:

- (i) supplying crystalline nylon-6 polyamide prepolymers or copolymers possessing 3 to 7 wt. % extractables content (as determined by methanol extraction: 1 g polymer to 5 ml methanol, 65°C, 16 hrs) to a solid state polymerizer; and
- (ii) solid state polymerizing in the presence of an inert gas having a superficial gas velocity of 0.03 to 0.61 m/s (0.1 to 2 ft/sec.) and at a temperature of at least 1°C below the softening point as indicated by DSC curves, wherein polyamide precursor is removed and the molecular weight of the resulting polymer is increased.

Claims 2-17, 19-21, 23-26 and 28 were corresponding dependent claims respectively.

II. A notice of opposition to the patent was filed on 4 August 2004 by Rhodia Chimie.

- (a) The grounds of opposition pursuant to Art. 100(a) EPC (lack of novelty, lack of inventive step) were invoked.

The opponent raised objections only in respect of the subject matter of claims 1-17.

- (b) Ten documents were cited in support of the opposition, *inter alia*:

D1: FR-A-1 505 307

D7: US-A-3 501 441 and

D10: FR-A-922 945

- (c) With a letter dated 4 May 2007 the opponent cited three further documents namely:

D11: Kirk-Othmer, Encyclopedia of Chemical Technology, Fourth Edition (1996), Volume 19, pages 454-457, 485-497, 511-518;

D12: Jacobs, D. B. and Zimmerman, J., "Preparation of 6,6-nylon and related polyamides" in "Polymerization Processes", Schildknecht, C.E., Skeist, I (Ed), Wiley and Sons (1977), pages 424-467;

D13: Augstkalns, V.A., "Polyamidation" in "Nylon Plastics Handbook", Kohan, M.I. (ed) Hanser Publishers 1995, pp 13-32.

- III. By an interlocutory decision announced on 5 July 2007 and issued in writing on 2 August 2007 the opposition decision held that the patent could be maintained in amended form on the basis of the main request, claims 1-28, submitted during the oral proceedings before the opposition division.
- Claim 1 of this request differed from claim 1 as granted in that in feature (b) the residence time in the flasher was specified as being from 1 to 5 minutes.
- (a) D11-D13 were admitted to the proceedings (see section II.(c), above).
- (b) The subject matter of claims 1-17 was novel.
- (c) With regard to inventive step the decision held:
- The process of claim 1 was characterised by the presence of at least three pieces of equipment, each having a residence time and pressure associated therewith, i.e.:
 - a reactor, (t=10-600 minutes, P>10 bar);
 - a flasher, (t=1-5 minutes, P=1 bar);
 - a separator (t<5 min, P=1 bar);
 - The closest prior art was D1, specifically example 6 thereof which disclosed all features of the claimed process except:
 - the residence time in the reactor;
 - the pressure and hold up time in the flasher;
 - The problem to be solved was the provision of prepolymer particles which allowed better control of the crystallisation morphology and thus to obtain more homogeneous high molecular weight polymers by solid state polymerisation (with reference to paragraph [0035] of the patent in suit).

- None of the prior art documents referred to this problem;
- On the premise that the problem of the patent in suit had been solved with respect to D1 by lowering the content of extractables, then the technical problem with respect to D1 could be formulated as the provision of a further method to produce polyamide prepolymers with less than 7% extractables;
- It was not obvious to modify the process of D1 in order to arrive at the process as claimed, in particular since the entire process of example 6 thereof took 7 minutes whereas the minimum time for the first step of the process of operative claim 1 was 10 minutes;
- The prior art provided no teaching to select a reaction time in the range as claimed in order to obtain prepolymers. In particular example 5 of D1 employed a reaction time of 43 minutes, but this resulted in a high molecular weight polyamide;
- Similarly the selection of the pressure and time conditions applicable for the flashing step were not derivable from the disclosure of a "superflasher" in D13;
- Starting from D1 the skilled person would have to combine too many pieces of information from different documents in order to arrive at the process of claim 1, i.e. this subject matter did not result from a logical and straightforward development of

the process of D1 in the light of other prior art or common general knowledge.

- (d) Regarding a second line of argumentation of the opponent that the technical problem defined in the patent in suit, i.e. the provision of polyamide prepolymers with an extractable content of less than 7 wt%, applied only to part of the scope of claim 1, i.e. that relating to type AB polyamides (e.g. PA 6) but did not arise in the case of type AABB polyamides (e.g. PA 66), the decision held that this problem did apply to both types of polyamide even if it was more relevant for type AB polyamides.

IV. A notice of appeal against the decision was filed by the opponent on 1 October 2007 the prescribed fee being paid on the same day.

V. The statement of grounds of appeal was received on 10 December 2007, accompanied by three further documents:

D14: US-A-3 948 862 (a document cited in D13 as reference 35);

D15: CA-A-527 473 (a document cited in D12 as reference 91);

D16: A further extract from D13, pages 34 to 37.

The appellant/opponent maintained objections pursuant to Art. 56 EPC, relying on D13 as clarified by D14 as the closest prior art.

The appellant observed that in the preparation of PA6 extractable side products were formed in large quantities - of the order of 11 %, of which 8% was caprolactam. These extractables had a large influence

on the properties of the final polyamide and the further processing thereof. In contrast in the preparation of PA66 - due to the totally different reaction mechanism involved (condensation of the two monomers) - only very low amounts of extractable by-products were formed, which exerted a negligible influence on the properties of the resulting polyamides. The appellant consequently concentrated its arguments on the embodiment relating to AABB type polyamides, explicitly stating that objections relating to the AB type polyamides were not raised. In particular on page 7, 6th complete paragraph of the statement of grounds of appeal it was stated "...il convient donc de modifier la revendication 1 de façon à exclure les polyamides de type AABB (tels que le PA66)" (in English: "it would thus be appropriate to modify claim 1 by excluding the polyamides of type AABB (such as PA66)").

- (a) D13 (as clarified by D14) disclosed a process for the preparation of AABB type polyamides having the three stages as specified in the operative claims (prepolymerisation, flash, separation).
- (b) The conditions specified for the different steps were disclosed in the prior art, viz:
 - two phase flow and pressure in the prepolymerisation stage from D14;
 - the conditions of time and pressure employed for the flashing stage from D12 and D15;
 - the conditions of time and pressure for the separation stage from D7.

VI. The respondent/patent proprietor replied with a letter dated 12 May 2008.

Dismissal of the appeal was requested. In the

alternative two sets of claims forming a first and second auxiliary request were submitted.

(a) The respondent/patent proprietor requested that D14-D16 not be admitted to the proceedings.

(b) With regard to inventive step the respondent argued essentially as follows:

- Although the process of the patent in suit was particularly advantageous for the preparation of PA6, it provided a viable alternative for the preparation of polyamides generally;
- As set out in paragraph [0017] of the patent in suit the overall route to polyamides comprised the three steps designated (A), (B) and (C) corresponding to the subject matter of claims 1, 18 and 22 respectively (cf section I, above) whereby step (A) was directed to the preparation of the polyamide prepolymers and step (B) concerned formation of at least partially crystalline particles of the polyamide prepolymers under proper conditions for optimal operation in the subsequent solid phase polymerisation (SPP) and step (C) related to SPP of the polyamide prepolymers to higher molecular weight product specifications;
- The process of claim 1 was not a conventional process for the manufacture of PA66;
- In view of the arguments of the appellant/opponent concerning the differences in the preparation of AABB and AB type polyamides it could not be obvious

to provide a process suitable for both types, in particular:

- D1, related to the preparation of high molecular weight polymers that could be directly spun into fibres, and hence did not relate to a prepolymer;
- D1 failed to disclose the three steps set out in claim 1 of the patent in suit. In particular step (b) of the process of claim 1 was not disclosed by D1;
- Example 6 of D1 related to the production of a low molecular weight polymer; however there was no information relating to the level of extractable impurities in this material and the appellant/opponent had not repeated the example to provide this information;
- Further D1 did not address the matter of providing a prepolymer suitable for further crystallisation and provided neither an indication as to how the process could be modified to provide such a material nor a motivation to do so;
- D13 dealt with the two types of polyamides separately and explicitly stated that different processes were required for the two types;
- Whilst the operative claim (under consideration in the appeal proceedings) was directed to a novel process to prepare a prepolymer (step (A) of the overall process as set out above), the reference to PA66 in D13 related to the preparation of high molecular weight material, not a prepolymer;

- None of the (other) cited documents provided any motivation to modify the therein disclosed processes so as to provide the process of claim 1 (which is the subject matter of the appeal proceedings).

VII. By letter of 23 March 2009 the respondent/patent proprietor informed the EPO that the patent in suit had been assigned to INVISTA Technologies S.à.r.l.

This change was duly recorded by the EPO (communication dated 21 April 2009).

VIII. With a letter dated 30 July 2009 the appellant/opponent argued that D14 - D16 should be admitted to the procedure, in particular because D14 and D15 were referred to in documents already in the procedure - D12 and D13 respectively - and merely clarified the common general knowledge as described by these.

The submissions with respect to inventive step can be summarised as follows:

- D13 in its reference to D14 disclosed a three step process for preparing a polymer;
- The product of the first two steps of the claimed process of the patent in suit (reaction and flashing) was a prepolymer, which in the final step - finishing - was converted to a polymer;
- Steps 1 and 2 of the process of D13 (condensation reaction and elimination of water) corresponded to step (A) of the overall process of the patent in suit, i.e. that specified in operative claim 1. The third step of the process

- of D13 corresponded to steps (B) and (C) of the overall process of the patent in suit;
- Thus the overall process specified in the patent in suit corresponded in its sequence of steps to the process taught in D13 for the preparation of AABB type polyamides;
 - The subject matter claimed was distinguished from the disclosure of D13 by the duration of the flashing and finishing/separation stages.
 - The technical problem compared to D13 was to provide an alternative process for the preparation of PA66;
 - In selecting the conditions to apply in carrying out the process of D13/D14 the skilled person would be guided by the need to avoid degradation of the prepolymer whereby:
 - D12 via its reference to D15 taught that a long hold up time in the flashing and separation stages resulted in degradation;
 - The skilled person was also aware that in order to prepare a prepolymer it was necessary to limit the time of each stage of the prepolymerisation process;
 - Consequently the time of flashing specified in D15 would be selected (2.96 minutes);
 - Similarly the time in the separator from the examples of D7 would be selected - which had been calculated by the appellant as being 82 seconds;
 - Consequently the skilled person seeking a variation of the process of D13/D14 to provide polyamide 66 prepolymer would be guided by the

teachings of D15 and D7 to select the necessary operating conditions.

- No technical problem had been solved with respect to polyamide 66 due to the absence of any difficulties arising from impurities in the case of this material, in contrast to the situation existing with the preparation of PA6 prepolymer.

IX. In a letter dated 22 December 2009 the respondent/patent proprietor objected to the submission of the appellant of 30 July 2009 (see section VIII, above) submitting that this contravened Art. 12 RPBA.

Additionally, with respect to inventive step it was argued that:

- D13 failed explicitly to describe the three steps of the process claimed;
- The combination of D13 with D14 also failed to generate the necessary disclosure in particular because this combination would not result in a disclosure of the residence time in the reactor;
- The disclosure of D13 and D14 was in any case only relevant to the particular apparatus - a "super flasher" - depicted in figure 2.8 of D13.
- It was not appropriate to combine the teachings of various specific parts of D13, D14, D12 and D15 to construct the inventive step argument.
- D13 did not represent the closest prior art since this was further away from the claimed subject matter than D1 - considered by the opposition division to be the closest prior art.

- X. On 26 May 2010 the Board issued a summons to attend oral proceedings on 12 August 2010.
- XI. With a letter of 24 June 2010 the appellant/opponent announced the attendance of two technical experts at the oral proceedings and requested that they be permitted to make submissions on technical matters.
- XII. With a further letter dated 7 July 2010 the appellant/opponent submitted an experimental report wherein, according to the appellant/opponent, PA66 and PA6 were prepared in a process as known from D7. The results confirmed the relevant general knowledge of the skilled person, referred to since the outset of the opposition procedure, with respect to the content of extractables in the resulting products of the prepolymerisations.
- It was explained that it had not been possible to submit the experimental report at an earlier stage due to work scheduling considerations at the appellant/opponent company.
- XIII. With a still further letter dated 9 July 2010 the appellant/opponent maintained its arguments that:
- (i) The process for the preparation of the two types of PA and the chemical reactions involved therein were completely different and
 - (ii) No technical problem had been solved with respect to AABB type polyamides.

With respect to the objection of lack of inventive step based on D13 and D14 the appellant/opponent reiterated its arguments set out in section VIII, above, that the

conditions of pressure and time for the flashing and separation step could be derived from the prior art, reference being made to D10 (cited in D14 as its US equivalent US-A-2 361 717) in respect of the flashing stage, and reiterating the arguments based on D12 in its reference to the teachings of D15.

A further objection of lack of inventive step based on D7 as the closest prior art was advanced.

XIV. Oral proceedings were held before the Board on 12 August 2010.

(a) With respect to the data filed with its letter of 7 July 2010 (see section XII, above) the appellant/opponent submitted:

- These data did not constitute new arguments but merely confirmed the general knowledge of the skilled person relating to the difference between AABB and AB type polyamides in particular with respect to the content of impurities formed;
- The failure to submit these data earlier was a consequence of a restructuring of the company of the opponent;

The respondent/patent proprietor submitted

- The argument in respect of which these data had been submitted was not new but had been in the opposition proceedings from the outset;
- Thus the appellant/opponent had had almost seven years to provide these;
- The experimental method employed in the new examples did not correspond to the teachings of any of the prior art documents on file;

- For example, the batch process employed in preparing the examples did not correspond to the continuous process which was the teaching of D7;
- The reported level of extractables was an order of magnitude lower than reported e.g. in D12;
- Consequently further work would be required to replicate these prior art teachings and understand the reasons for the diverging results of the appellant/opponent;
- The time available was however insufficient due to the lateness with which these data had been submitted.

After deliberation the Board announced its decision that these data were not admitted to the procedure.

(b) With respect to the line of argumentation based on D7 as the closest prior art, presented for the first time with its letter of 9 July 2010 (see section XIII, above), the appellant/opponent submitted:

- There were a number of documents relevant to processes for AABB type polyamides. It was legitimate and valid to pursue parallel attacks on inventive step;
- The attack based on D7 was simply a new argument in conjunction with the attack based on D13/D14 set out in the statement of grounds of appeal and should be admitted to the procedure;

- D7 helped to clarify the teachings of D1 and D13/D14;
- D7 was a self contained teaching - it was not necessary to consult further documents to understand this document.

The respondent/patent proprietor submitted:

- D7 had been in the proceedings since the outset, but had never been proposed as representing the closest prior art;
- There was no justification for citing this document as closest prior art at such a late stage of the proceedings;
- The arguments of the appellant/opponent relied on making assumptions about conditions in the reactor and flasher. D7 did not disclose the relevant information explicitly but made reference at col. 4 lines 51-56 to two further documents "incorporated by reference";
- These documents had not been cited in the present proceedings and referring to these now would add further complexity and delay to the appeal proceedings.

After deliberation the Board announced that the change of case represented by the new line of argument based on D7 as the closest prior art was not admitted to the proceedings.

- (c) With respect to the admissibility of D14-D16, cited for the first time with the statement of grounds of appeal, the respondent/patent proprietor made the observation that the appeal procedure was intended to be a re-evaluation of

the arguments presented in first instance proceedings but should not be taken as an opportunity to present new arguments.

However it was acknowledged that admittance of these documents was a matter of discretion by the Board.

(d) With respect to the objection raised by the respondent/patent proprietor to the letter of 30 July 2009 filed by the appellant/opponent during the appeal proceedings (see sections VIII and IX, above) the respondent/patent proprietor argued:

- This submission introduced new arguments and was not solely a response to the arguments presented by the respondent/patent proprietor in its rejoinder;
- These arguments could and should have been presented in the statement of grounds of appeal.

The appellant/opponent submitted:

- No new aspects had been introduced in the letter of 30 July 2009 which
- Merely clarified the position taken with respect to D13 and D14 in the statement of grounds of appeal.

After deliberation the Board decided that the submission of the appellant/opponent of 30 July 2009 was admitted to the proceedings.

(e) With respect to inventive step it was not a matter of dispute between the parties that:

- D14, referred to in D13, could be considered to represent the closest prior art;

- D14 disclosed - in general terms - the three steps set out in operative claim 1 of the patent in suit;
- In the first step of the process of D14 a two phase system existed (liquid/vapour).

The appellant/opponent further submitted regarding the first stage of the process:

- The time disclosed in D14 for the first stage was 40 minutes, which was within the range of 10-600 minutes specified in operative claim 1;
- The reaction mixture did not boil immediately on entering the reaction zone, hence the times specified in D14 and the patent for this stage of the corresponding processes had to include a stage prior to formation of the vapour. Hence the actual time the system was present in the vapour phase was indeterminate both in D14 and in the process of the operative claims, meaning that this feature did not provide a distinction over D14.

The respondent/patent proprietor submitted that:

- Operative claim 1 specified that the vapour phase was present for 10-600 minutes, i.e. this time applied once boiling had been established, and hence this feature was defined;
- The appellant/opponent had not shown directly and unambiguously at what point boiling started in the process of D14, i.e. for how much of the disclosed period of

40 minutes time a vapour phase would actually be present.

Regarding the second stage of the process, i.e. the flashing step, the appellant/opponent submitted:

- D14 disclosed a time in the flasher of 30 minutes, whereas operative claim 1 specified 1-5 minutes;
- The flash time directly influenced the molecular weight as was known from the prior art;
- D14 provided an improvement over the flash tube disclosed in D10;
- Alternatives were known to the skilled person, e.g. from D12, page 454ff which referred to D15 (reference 91 thereof). This passage of D12 (on page 456) taught the skilled person to avoid long hold up times in the flashing stage to avoid degradation;
- Thus D12 and D15 (and D10) taught to avoid long flash times;
- Consequently the skilled person seeking to optimise the flash time would be guided to employ a time of 1-5 minutes;
- The patent proprietor had confirmed in its letter of January 2008 (during the opposition proceedings) that a short flashing time ensured that low molecular weight polymer was formed.

The respondent/patent proprietor submitted:

- The appellant/opponent was taking each step of the process in isolation instead of

considering the overall aim of the patent in suit, i.e. to provide a prepolymer suitable for crystallisation and then solid state polymerisation;

- D14 had a different aim, i.e. to provide a polymer;
- Thus there was no reason to start from D14 as closest prior art and consequently the appellant/opponent was using an unrealistic presentation of the problem;
- In any case there was no motivation for the skilled person to change the flash time disclosed in D14 by referring to the teachings of D10 or D15;
- In particular since D14 stated that its process was an improvement on the teaching of D10 it would be inconsistent with the teaching of D14 to modify this by importing the teaching of this older document;
- Similarly D14 cautioned against using the flash tube that is disclosed in D15;
- Thus D14 was not a good starting point - too many changes were required to the teaching thereof which could only be provided by mosaicing a large number of documents.

Regarding the separation step, the appellant/opponent argued essentially as follows:

- The pressure in the separator of D14 was 1 atmosphere, i.e. as specified in operative claim 1;
- Regarding the residence time, analogously to the situation in the flasher it would be

obvious to shorten this in order to obtain a prepolymer. Prior art documents D7, D11 and D12 taught short separation times;

- In particular it had been shown by calculation that the residence time in the flasher of D7 was of the order of 82 seconds.
- Thus the selection of this parameter was a matter of standard practice.

The respondent/patent proprietor submitted as follows:

- D14 did not specify the residence time in the separator;
- Furthermore, D14 disclosed the use of a specific separator (col. 2 lines 36-38);
- Thus there was no motivation to employ in the process of D14 a separator from another document e.g. D7, which was not even employed in conjunction with the same process steps as set out in the operative claim;
- The calculation of the appellant/opponent regarding the residence time in the separator of D7 was dismissed since a number of unwarranted assumptions had been made to arrive at this value.

After the parties confirmed that they did not intend to make any further submissions on the main request the debate on this request was closed.

XV. The parties at this point presented the following requests:

The appellant/opponent requested that the decision under appeal be set aside and that the European patent number 1 007 582 be revoked.

The respondent/patent proprietor requested that the appeal be dismissed. In the alternative that the patent in suit be maintained on the basis of the sets of claims according to the first or second auxiliary requests, as filed together with the letter of 12 May 2008.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of D14-D16 cited with the statement of grounds of appeal.*

All of these documents are related to documents already in the procedure and, in the case of D14 and D15 serve to elucidate the teachings of the previously cited documents. Thus D14 is the source of the teaching of D13 to which the decision under appeal referred (see section III.(c), above) and refers to the US equivalent of D10 (see section XIII, above), D15 is referred to in D12 whilst D16 is a further passage from the book of which D13 is an excerpt.

Accordingly the teachings of D14 and D15 were already relied upon in the opposition procedure (by means of references thereto in secondary literature) and the introduction of these "source" documents serves to clarify and elucidate the corresponding disclosures of

D12 and D13. As a consequence the Board decided to admit these documents to the appeal procedure.

D16 serves to expand upon certain aspects of the teaching D13 and consequently this document was also admitted to the procedure.

3. *Admissibility of the submissions of the appellant/opponent with the letter of 30 July 2009*
- 3.1 In raising its objections the respondent/patent proprietor did not identify any aspects of the submission which went beyond the ambit of the statement of grounds of appeal, rather the objection seemed to be that any reaction at all had been filed to the rejoinder (see section IX, above).
- 3.2 In particular, in this letter the appellant/opponent responded to submissions made by the respondent/patent proprietor with regard to:
 - The admissibility of D14-D16, filed together with the statement of rounds of appeal;
 - The issue of lack of inventive step with respect to D13 and D14, with reference to D7, D12, D15 and D16 all of which matters had been raised in the statement of grounds of appeal.
- 3.3 Accordingly the Board is satisfied that the submission of the appellant/opponent of 30 July 2009 does not constitute an attempted change of case (cf Art. 12(2) and 13(1) RPBA) but is solely a response to the arguments of the respondent in its rejoinder. Accordingly this submission is admitted to the procedure.

4. *Admissibility of the experimental report submitted by the appellant/opponent with letter of 7 July 2010*

4.1 This report was submitted after oral proceedings had been arranged (cf Art. 13(3) RPBA).

4.2 Further, the appellant/opponent did not demonstrate that the submission of the report had been occasioned by arguments presented by the respondent/patent proprietor in the course of the appeal proceedings.

4.3 On the contrary the only reason advanced for the failure to submit these data earlier in the opposition and opposition/appeal proceedings was the constraints imposed by scheduling of work at the company (see sections XII and XIV.(a), above).

4.4 According to Art. 12(2) RPBA the statement of grounds of appeal shall contain a party's complete case. Further according to Art. 13(3) RPBA amendments sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which cannot be dealt with (by the board or the other party) without adjournment of the oral proceedings.

4.5 The stated purpose of submitting the experimental report was to support the arguments of the appellant/opponent regarding the differences in the preparation processes of the two types of polyamide, i.e. AB and AABB types in particular in view of the level of impurities produced.

- 4.6 This issue had been raised for the first time in the second letter of the opponent in the opposition proceedings dated 3 October 2006, i.e. almost four years before the data were submitted (7 July 2010).
- 4.7 The respondent/patent proprietor has at no point challenged the position of the appellant/opponent regarding the differences in the two types of polyamide processes.
- 4.8 Accordingly the appellant/opponent had had almost four years between the time it first raised this matter and the oral proceedings before the Board to submit data in relation to this aspect.
- 4.9 The appellant/opponent has further advanced no reasons associated with the course of the appeal procedure itself as justification for filing these data at this particular stage of the proceedings.
- 4.10 Regarding the nature of the data, although it is stated that these experiments were based on D7 it is conspicuous to the Board that whilst D7 relates to a continuous process the experiments of the appellant/opponent appear to have been carried out in a batchwise mode.
Accordingly these experiments do not even reflect the teaching of D7. Nor has it been shown that these correspond to any of the other documents cited in the procedure.
- 4.11 Thus apart from the lateness and the fact that these data were submitted in order to demonstrate an aspect that is not in dispute, these data lack relevance since

they have not been shown to correspond to any of the prior art cited in the procedure.

4.12 Accordingly these data were not admitted to the procedure.

5. *Admissibility of the objection pursuant to Art. 56 EPC relying on D7 as the closest state of the art*

5.1 This objection was presented in the letter of the appellant/opponent of 9 July 2010, i.e. after issue of the summons to oral proceedings and just over one month before the oral proceedings (see section XIII, above).

5.2 The teaching of D7 is directed to a process for preparing polyamides, the emphasis being on the final stage, i.e. the finishing zone.

5.3 Although the process of D7 includes steps of evaporation, reaction and flashing, D7 itself does not contain details of these steps but relies on two other documents to elucidate these (referred to at column 4, lines 51-60), which documents were however not provided by the appellant/opponent during the course of the procedure.

5.4 Thus due to the incomplete nature of the teaching of D7, the new argument based thereon as closest prior art, presented at a very advanced stage of the proceedings, raised issues which could not have been dealt with by the respondent/patent proprietor without adjourning the oral proceedings in order to obtain and consult the further documents cited therein.

5.5 Consequently pursuant to Art. 13(3) RPBA this argument was not admitted to the procedure.

6. *The patent in suit, the technical problem*

6.1 According to paragraph [0001] the invention concerns a process for the preparation of polyamide polymers, which process according to paragraph [0017] of the patent has the following steps:

- Prepolymerisation of monomers in a reactor system comprising a reactor, a flasher and a separator to form polyamide prepolymers;
- Formation of at least partially crystalline particles of the prepolymer under conditions for optimal operation in the subsequent solid phase polymerisation;
- Solid state polymerisation.

6.2 Claims 1-17 of the operative main request, i.e. those which have been challenged upon opposition and appeal, relate to the first stage of this process, i.e. the preparation of the prepolymer.

6.3 The first stage is explained in more detail in paragraph [0009] of the patent in suit where it is stated that the product is a prepolymer with less than 7% extractable impurities, "extractable" meaning by extraction with methanol (subparagraph (b)), as specified in the corresponding subparagraph of operative claim 1.

6.4 This stage of the process is exemplified in examples 1-4 of the patent in suit, whereby examples 3 and 4 result in polymers having levels of impurities above

the maximum specified in operative claim 1 ("less than 7 wt%").

According to example 1 the monomer - caprolactam - is introduced into a pipeline reactor. In the first stage the conditions of pressure and temperature result in the formation of a dual phase system, leading to a concurrent two phase vertical flow including back flow resulting in improved mixing. The pressure in this first stage is maintained by means of a valve, the residence time being 35-40 minutes.

The output from this stage is passed to a flasher stage with a residence time of 2 to 3 minutes at a pressure of ca 1 atmosphere (cf claim 1).

Finally the flasher effluent flows into a separator constructed as an expanded final section of the flasher, allowing vapours to be removed, the polymer being removed via a drop pipe. The residence time in the separator is less than 1 minute.

The resulting polymer has an impurity content of 2.8 to 3 wt.-% monomer and 0.14 to 0.15 wt.-% cyclic dimer.

The results of example 2 are similar.

6.5 In view of this evidence the problem to be solved by the subject matter of operative claims 1-17 can be formulated as to provide a process for preparing polyamide prepolymers with a low content of extractables.

7. *The teaching of D14 - relevance to the problem of the patent in suit*

7.1 The appellant/opponent considered the teaching of D14, as referred to in D13, to represent the closest prior art. At the oral proceedings the respondent/patent

proprietor did not dispute this (see section XIV.(e), above).

7.1.1 This document relates to a continuous process for the preparation of aliphatic polyamides. The focus of D14 is on reducing the loss of diamine by providing a means for capturing and recombining this (col. 1 lines 40-57). This aspect is emphasised in the discussion of D14 on page 22 of D13.

7.1.2 The polymer produced is suitable to be used directly to form final products, e.g. by being sent to a spinner to form fibres (D14 col. 3 lines 24-26). This indicates that the product of the process of D14 is not a prepolymer.

7.1.3 According to the discussion in D14 under "Summary of the Invention" (col. 1 line 62-65) the process thereof is based on the process of D10 (the US equivalent being referred to at col. 1 line 14 of D14), which it is explained has the following steps:

- in an initial stage an aqueous solution of a diamine-dicarboxylic acid salt is passed through a reaction zone under conditions of temperature and pressure which prevent the formation of steam while the salt passes through this zone and is converted to polyamide;
- The reaction mass is then passed through at least one other zone at amide forming temperatures and at a pressure permitting the formation of steam over the course of which stage the pressure becomes substantially atmospheric (D14 col. 1 line 65 to col. 2 line 2);

- Finally the reaction mass passes via horizontal pipe - reference 28 - to a separator (D14, reference 30 - col. 2 lines 35-37).

- 7.1.4 The "improvement" which D14 provides to the process of D10 is that in the "reaction zone" conditions are employed which permit the formation of steam and vapourised diamine, whereby a portion of the vapourised diamine is recombined with the salt for reaction therewith in the reaction zone (D14 col. 1 line 59 to col. 2 line 7 in particular col. 2 lines 2-7). As explained at col. 3 line 1ff of D14 steam and some amine are evolved as soon as the reaction mass boils, providing a two phase annular flow through the reaction system.
- 7.1.5 Thus the process of D14 includes, like that of operative claim 1, an initial stage in which two phases are present and there is a flow of the phases.
- 7.1.6 The residence times as reported in the Table of D14 (col. 4) are between 40 and 56.4 minutes in the reactor. However it is not reported at which point boiling commences. Thus it is not known for what time the reaction mass is subject to two-phase conditions (cf feature (a) of operative claim 1).
- 7.1.7 The residence time in the flasher is from 29.7 to 84.5 minutes, i.e. outside the range of 1 to 5 minutes specified in operative claim 1.
- 7.1.8 The time in the separator is not disclosed.

7.2 From this analysis it is apparent firstly that the aim of D14 is different from that of the process of operative claims 1-17 since D14 is not directed to the preparation of a prepolymer (to be subjected to further polymerisation stages) but to a polymer which is suitable for use directly e.g. by spinning. Accordingly, D14 does not address the same technical problem as operative claim 1 of the patent in suit.

7.3 Secondly, and as explained above, the parameters of the process as required by operative claim 1 are not disclosed in D14. Thus, it will be recalled, the time during the first stage in which biphasic operation occurs is not disclosed since it is not stated at which point the reaction mixture starts to boil. Further the residence/hold up times in the flashing stage disclosed in D14 are significantly higher than those specified in operative claim 1 whilst those in the separation stage are unknown.

8. *Obviousness*

8.1 Since D14 does not even address the same problem as the patent in suit, the skilled person seeking to provide a process for the production of a polyamide prepolymer would have no reason even to consult D14. Thus this document cannot provide a valid closest state of the art according to the problem-solution approach, the existence of superficial similarities between the method disclosed in D14 and that specified in the operative claims 1-17 notwithstanding (cf T 506/95, 5 February 1997, not published in the OJ EPO, in particular Reasons 4.1, second section and the decisions discussed therein).

- 8.2 On the contrary the apparent relevance of D14 arises only due to the superficial similarity of the different steps of the process thereof and those of the operative claims, i.e. *ex post facto*.
- 8.3 Even if nevertheless, D14 were to be consulted, it would not guide the skilled person to the claimed process since it fails to teach the conditions employed in each of the three stages of the claimed process, as explained above, and, due to the differing aim, thereof does not provide any pointers as to how the process thereof might be adapted to provide a prepolymer.
- 8.4 The appellant/opponent has argued that the teachings of further documents, namely D7, D10, D12, and D15 could be combined with D14 in order to arrive at the required modifications (see sections VIII, XIII and XIV.(e), above).
- 8.4.1 D10, as noted above, provides the starting point of the invention of D14, i.e. D14 sets out to provide an improvement over the process of D10. Accordingly it would be incompatible with the teachings of D14 to revert to or rely on a document with respect to which D14 purports to provide an improvement. Further, D10, like D14 is directed to the production of polymers which can be directly used to form articles, rather than a prepolymer for further processing (D10, page 5 lines 35-48). In particular this passage emphasises that the product resulting from the process of D10 can be used directly thus avoiding the need to remelt the polymer prior to forming, confirming that

D10, like D14 is not directed to the provision of a prepolymer.

8.4.2 D12 is a general treatise on polyamides and the processes for the preparation thereof. D12 contains no considerations relating specifically to the preparation of prepolymers and has no relationship to D14 beyond the fact that both are concerned with polyamides.

8.4.3 D15 also starts from the teachings of D10 (in its US equivalent) and addresses the problem of avoiding sudden temperature and pressure drops inherent in said process (cf D15 col. 1 line 25ff). The polyamide so produced is, as in the case of D14, suitable for use directly to form articles such as filaments, fibres and films e.g. by spinning or casting (D15, column 3 first partial paragraph). Consequently D15 also does not provide any pointers to a process for the production of a polyamide prepolymer.

8.4.4 D7, like the other documents considered, relates to a process for providing a high molecular polyamide whereby the emphasis is on removing water from the intermediate prepolymer by subjecting it to treatment in a thin film device - designated "Finishing Zone" (D7, column 3, "Summary of the Invention", in particular line 42).

Thus D7 also is not directed to the preparation of prepolymers and thus is not relevant to the technical problem to be solved by the subject matter of the operative claims.

- 8.5 Accordingly neither D14 on its own, nor any of the documents cited in combination therewith even relate to the same problem as that stated to be solved by the subject matter of the operative claims, and therefore inherently these teachings are not appropriate, either singly or in combination to provide a solution to the relevant technical problem.
- 8.6 The arguments of the appellant/opponent relating to obviousness in the light of D14 are therefore entirely *ex post facto* in that starting from the teaching of D14, and disregarding the absence of any reference to the technical problem of the patent in suit it is sought to identify further documents which disclose (variations of) the features necessary in order to modify the disclosure of D14 so as to align it with the subject matter of the operative claims. The approach taken with respect to D14 parallels closely that taken with respect to D1 before the opposition division (see section III, above), which document is also directed to the production of high molecular weight polyamides, not prepolymers (cf the first paragraph of D1 and the *Résumé*.)
- 8.7 The appellant/opponent has therefore failed to prove that the subject matter of operative claims 1-17 is rendered obvious by the cited prior art. Consequently it has to be concluded that this subject matter meets the requirements of Art. 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar:

The Chairman:

G. Nachtigall

A. Däweritz