

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 27 June 2017**

Case Number: T 1309/15 - 3.3.03

Application Number: 05256689.0

Publication Number: 1652863

IPC: C08F10/00, C08F4/655, C08F4/02

Language of the proceedings: EN

Title of invention:
Enhanced polyolefin catalyst

Applicants:
Nova Chemicals Corporation
Ineos Sales (UK) Limited

Relevant legal provisions:
EPC Art. 84

Keyword:
Unclear functional feature



Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1309/15 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 27 June 2017

Appellants: Nova Chemicals Corporation
(Applicants) 1000 - 7th Avenue SW
Calgary, Alberta T2P 5L5 (CA)

Ineos Sales (UK) Limited
Hawkslease Chapel Lane
Lyndhurst
Hampshire SO43 7FG (GB)

Representative: Watson, Robert James
Mewburn Ellis LLP
City Tower
40 Basinghall Street
London EC2V 5DE (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 2 February 2015 refusing European patent application No. 05256689.0 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman D. Semino
Members: F. Rousseau
C. Brandt

Summary of Facts and Submissions

- I. The appeal lies from the decision of the examining division posted on 2 February 2015 refusing European patent application No. 05 256 689.0.
- II. The decision was based on the sole claim request then on file, i.e. claims 1 to 19 as submitted with letter of 19 January 2015. In the same letter the applicants had withdrawn their request for oral proceedings and requested a decision according to the state of the file, which request had been reiterated in the telephone conversation of 20 January 2015, as indicated in section 7 of the notice thereof posted on 2 February 2015. Claim 1 of said request read as follows:

"1. A process for preparing an alpha-olefin polymerization catalyst precursor composition, said catalyst precursor, when activated with a co-catalyst, having a productivity of greater than 1,500 g of polymer per gram of catalyst under standard gas phase operations used to manufacture a 1 MI (g/10 min), ethylene hexene copolymer resin having a density of 0.918 g/cc, where the MI is determined according to ASTM D1238-04 at condition 190/2.16 and the density is determined according to ASTM D 792-00, comprising: contacting at a temperature from 0°C to 100°C, a support which has been heat treated to remove adsorbed water and having a residual surface hydroxyl content from 0.1 to 5 mmol/g of support, which support is subsequently treated with a first aluminum compound of the formula $R^1_bAl(OR^1)_aX_{3-(a+b)}$, wherein a is an integer from 0 to 3, b is an integer from 0 to 3 and the sum of a+b is from 0 to 3, R^1 is the same or different C_{1-10} alkyl radical, reactive with the surface hydroxyl

groups to provide from 0.5 to 2.5 wt % Al on the support, in an inert hydrocarbyl solvent or diluent, with or without isolation of the treated support from the hydrocarbyl solvent or diluent, with:

- (a) a transition metal compound;
- (b) a magnesium halide, prepared by reacting in situ
 - (i) an alkyl magnesium compound of the formula $(R^5)_eMg X_{2-e}$ wherein each R^5 is independently a C_{1-8} alkyl radical and e is 1 or 2 and X is a chlorine or bromine atom with
 - (ii) a reactive organic halide selected from the group consisting of CCl_4 and C_{1-6} alkyl halides and mixtures thereof;

(c) a second aluminum compound of the formula $R^1_bAl(OR^1)_aX_{3-(a+b)}$, wherein R^1 , a and b are as defined above and the second aluminum compound may be the same as or different to the first aluminum compound; and

- (d) an electron donor;

and separating the resulting catalyst precursor from the inert hydrocarbyl solvent or diluent; provided that the order of reagent addition to the support meets the following conditions:

- (i) the transition metal compound cannot be added first;
- (ii) when the alkyl Mg compound is added first, the transition metal compound cannot be added second;
- (iii) when the second aluminum compound is added first, the transition metal compound cannot be added second;
- (iv) when the alkyl Mg compound and the second aluminum compound are added first and second, in any order, the transition metal compound cannot be added third;
- (v) the transitional metal compound must be added after the reactive organic halide;
- (vi) the transition metal compound must be added after the alkyl magnesium compound;
- (vii) the electron donor cannot be added last;

- (viii) the reactive organic halide cannot be added last;
- (ix) if the reactive organic halide is first the second aluminum compound cannot be second;
- (x) if the second aluminum compound is first, the reactive organic halide cannot be second; and
- (xi) when the transition metal is last, the second aluminum compound and alkyl Mg compound cannot be third or fourth, in any order."

- III. The decision according to the state of the file referred to communications dated 10 April 2014, 14 January 2015 and 20 January 2015. The communication dated 14 January 2015 was the notice of the telephone consultation which took place on 9 January 2015. The wording "communication" in respect of the date 20 January 2015 undisputedly referred to the telephone conversation of the same day for which a notice was posted on 2 February 2015.
- IV. Having regard to the communications referred to in the decision, the main objection identified by the examining division related to the lack of compliance of the claimed subject-matter with respect to the requirements of Article 84 EPC and Article 83 EPC due to the difficulty to prepare a catalyst precursor meeting the productivity requirement of claim 1 when producing a polymer having the MI and density defined in said claim.
- V. The decision was appealed by the applicants (appellants) with a notice of 17 March 2015. In the statement setting out the grounds of appeal the appellants pursued as the sole request the set of claims underlying the contested decision.

VI. In its preliminary opinion sent in preparation for the oral proceedings the Board indicated, *inter alia*, that the functional feature defining the productivity of the catalyst precursor resulted in claim 1 to lack clarity (Article 84 EPC).

VII. The appellants answered the Board's communication with letter of 10 May 2017. A declaration of Mr Kelly (D1), a copy of the document already cited in the statement setting out the grounds of appeal and referred to on page 13, lines 10-13 of the application as filed, "Gas Phase Ethylene Polymerization: Production Processes, Polymer Properties, and Reactor Modeling" by Tuyu Xie *et al*, Ind. Eng. Chem. Res. 1994, 33, 449-479 (D2) and an excerpt of "Plastic Packaging, Interactions with Food and Pharmaceuticals", page 32, second edition, WILEY-VCH, 2008 (D3) as well as an auxiliary request were submitted with the applicants' letter. Claim 1 of the auxiliary request differed from claim 1 of the main request in that:

- for feature (a) the transition metal compound was specified to be "of the formula $Ti(OR^2)_cX_d$ wherein R^2 is selected from the group consisting of a C_{1-4} alkyl radical, and a C_{6-10} aromatic radical, X is selected from the group consisting of a chlorine atom and a bromine atom, c is 0 or an integer up to 4 and d is 0 or an integer up to 4 and the sum of c+d is the valence of the Ti atom",

- for feature (b) the definition of the reactive organic halide used for preparing the magnesium halide was restricted to the group consisting of " CCl_4 and C_{3-6} secondary and tertiary alkyl halides and mixtures thereof", and

- the condition "said catalyst precursor having a molar ratio of total Al to Ti from 2:1 to 15:1; a molar ratio

of Al from the second aluminum component (Al^2): Ti from 1:1 to 8:1 a molar ratio of Mg:Ti from 1:1 to 20:1; a molar ratio of active halide from the alkyl halide to Mg from 1:1 to 6:1; a molar ratio of electron donor to Ti from 0:1 to 18:1 and the titanium is present in the catalyst precursor in an amount from 0.20 to 3.0 weight % inclusive of the support;" was inserted between "... (d) an electron donor;" and "and separating the resulting catalyst precursor ...".

VIII. Oral proceedings took place on 27 June 2017.

IX. The appellants requested that the decision under appeal be set aside and that a patent be granted on the basis of the description and claims filed on 19 January 2015 or, alternatively on the basis of the claims according to the auxiliary request filed with letter dated 10 May 2017.

X. As far as relevant to the present decision, the submissions of the appellants can be summarized as follows:

(a) A functional feature should be established in its entirety. Thus, the question to be considered was not whether the expression "standard gas phase operations" had a clear meaning, but whether the whole feature "having a productivity of greater than 1,500 g of polymer per gram of catalyst under standard gas phase operations used to manufacture a 1 MI (g/10 min), ethylene hexene copolymer resin having a density of 0.918 g/cc, where the MI is determined according to ASTM D1238-04 at condition 190/2.16 and the density is determined according to ASTM D 792-00" would be clear to the skilled person.

- (b) Declaration D1 described in paragraph 5 the huge mass of polyethylene produced every year, and that most significant manufacturers would industrially produce a polyethylene having the specified density and MI (paragraph 6). The person skilled in the art would also recognise the desirability of meeting the productivity requirement set in the industrial context. The claim was directed to the person skilled in the art, in the present case an industrial chemist working on a site producing polyethylene. Thus, the standard gas phase conditions used in the functional definition would be well known to the person skilled in the art - these would be the conditions used daily to produce polyethylene. As shown in D2, the skilled person was familiar with all conditions used in such industrial processes and knew which conditions were necessary in order to obtain a copolymer having the required density and melt index, even if slight variations existed between the various processes used.
- (c) The productivity requirement was present in claim 1 only in order to avoid that the claim would cover inactive catalysts. Such feature, if found unclear, could remain in the claim as it was not there to provide novelty or inventive step.
- (d) Accordingly, the functional feature of claim 1 was clearly defined and claim 1 met the requirements of Article 84 EPC.

Reasons for the Decision

Main request

1. Claim 1 of the main request is directed to a process for preparing a catalyst precursor composition, said process being defined not only in terms of process steps, comprising *inter alia* the type of compounds to be reacted, but also by a functional feature. This functional feature defines that the catalyst precursor obtained by the various process steps recited in claim 1 must be able, when activated with a co-catalyst, to have a productivity of greater than 1,500 g of polymer per gram of catalyst under standard gas phase operations used to manufacture a 1 MI (g/10 min), ethylene hexene copolymer resin having a density of 0.918 g/cc, where the MI and the density are determined according to the standards specified in claim 1.

2. The feature defining the productivity of the catalyst precursor, when activated with a co-catalyst, is not an inherent feature resulting from the sole process steps recited in claim 1, but an additional restriction imposed on the claimed subject-matter. This is not only corroborated by the description of the application in the passage from page 22, line 20 to page 23, line 16, but was also acknowledged on appeal by the applicants. According to said passage even following the criteria defined in claim 1 with respect to the order of addition of the reagents to the support "*will likely produce a number of catalysts that show low productivity and hence have limited commercial applicability. Thus, productivity is a limitation to limit the number of catalyst formulations that proves*

to be useful. The productivity criteria is that the catalyst has a productivity of greater than 1,500 grams of polymer per gram of catalyst (g/g) under standard commercial plant operations such as for an ethylene hexene copolymer having an MI of 1 and a density of 0.918. The conditions of operation of a plant to produce a resin having a melt index (MI) of 1 as determined by ASTM D 1238-04 and a density of 0.918 g/cc as determined by ASTM D 792-00 are well known to those skilled in the art. However, if the productivity of a catalyst is below 1,500 g of polymer/g of catalyst due to the poor selection of components and or loading levels this does not mean that a particular synthesis order is poor. It may simply mean that another formulation is required to obtain a usable catalyst when synthesizing using a particular order of addition". Accordingly, in order to know whether a catalyst precursor resulting from the process step defined in claim 1 falls within the claimed invention or not, the ability of that catalyst precursor when activated with a co-catalyst to produce under standard gas phase operations an ethylene hexene copolymer resin having a 1 MI (g/10 min) and a density of 0.918 g/cc with a productivity of greater than 1,500 g of polymer per gram of catalyst must be tested.

3. There is no doubt that the expression "standard gas phase operations" is a generic qualitative expression deprived of any concrete specific meaning. In any case, the conditions defined by this expression, even assuming, to the benefit of the appellants, that it indicates the conditions used daily to produce polyethylene having the properties required in claim 1, i.e. ethylene hexene copolymer resin having a 1 MI (g/10 min) and a density of 0.918 g/cc, will vary depending on the producer. Accordingly, the expression

"standard gas phase operations" does not cover a single set of conditions. Those include, just to name a few, temperature, hydrogen and hexene pressures relative to that of ethylene which are not specified in claim 1, which conditions influence the productivity of the precursor-catalyst. In addition, claim 1 does not specify the type of co-catalyst to be used and its amount, which measures also influence the productivity of the precursor catalyst. Claim 1 as indicated by the appellants is addressed to the skilled person, who is well aware that the above conditions would vary depending on the manufacturer. Hence, the skilled person knows that there is not only one single set of conditions conventionally used for producing a polyethylene in accordance with the definition of claim 1. It follows therefore that depending on the conditions chosen to carry this productivity test, the same catalyst precursor composition obtained by following the process steps recited in claim 1 can be considered to achieve the functional feature defined in claim 1, or not. Accordingly, in the absence of definition for specific and clear conditions for testing the catalyst precursor composition resulting from the process steps recited in claim 1, it can only be concluded that the functional feature contained in claim 1 does not allow a clear definition of the process for which protection is sought contrary to Article 84 EPC.

4. The opinion of the appellant that an unclear feature could remain in the claim if it was not there to provide novelty or inventive step cannot be shared by the Board. As far as functional features are concerned, it is referred to the Case Law of the Boards of Appeal of the EPO, 8th edition, 2016, in particular its section II.A.3.4 wherein it is pointed out that the

effort to define a feature in functional terms had to stop short where it jeopardised the clarity of a claim as required by Article 84 EPC.

5. Consequently, the main request is not allowable.

Auxiliary request

6. The auxiliary request differs from the main request in that the definitions of the transition metal and of the reactive organic halide compound are restricted and conditions concerning the proportions of various chemical elements and amount of titanium in the catalyst precursor have been introduced. Hence, these amendments do not concern the definition in claim 1 of the conditions to be used for testing the catalyst precursor composition resulting from the process steps recited in claim 1. Furthermore, the appellants did not submit that these additional characteristics would render the above functional feature to become inherent in the catalyst precursors, let alone evidence in this respect, and the Board does not see any reason why it should be so. Accordingly, the features inserted in claim 1 cannot overcome the the objection that claim 1 lacks clarity. Accordingly, claim 1 of the auxiliary request does not meet the requirement of Article 84 EPC and the auxiliary request is also not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated