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**Datasheet for the decision  
of 20 June 2012**

**Case Number:** T 1455/08 - 3.3.03

**Application Number:** 98946420.1

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**IPC:** C08G 65/10, C08G 65/26,  
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**Title of invention:**  
Preparation of functionalised polyethers

**Patent Proprietor:**  
ARCO Chemical Technology, L.P.

**Opponents:**  
Hansen, Bernd, Dr.  
BASF Aktiengesellschaft

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56, 84

**Keyword:**  
"Inventive step - (no) - (main request, first, second, fourth,  
fifth auxiliary requests)"  
"Claims - clarity - (no) - (third auxiliary request)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1455/08 - 3.3.03

**DECISION**  
of the Technical Board of Appeal 3.3.03  
of 20 June 2012

**Appellant:** BASF Aktiengesellschaft  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office dated  
13 March 2008 and posted 13 May 2008 concerning  
maintenance of the European patent No. 1012203  
in amended form.

**Composition of the Board:**

**Chairman:** B. ter Laan  
**Members:** M. C. Gordon  
C.-P. Brandt

## Summary of Facts and Submissions

- I. The appeal lies from the interlocutory decision of the opposition division announced on 13 March 2008 and posted on 13 May 2008 according to which it was held that European Patent no. 1 012 203 (based on application no. 98 946 420.1) could be maintained in amended form on the basis of the second auxiliary request - claims 1-31 as filed on 11 January 2008.
- II. The patent was granted with a set of 33 claims, whereby claim 1 read as follows:

"A hydroxyl-functional and unsaturation-functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether and (b) not more than 0.020 meq/g unsaturation beyond that of the initiator-molecule derived unsaturation preparable by:

- a) selecting an initiator molecule having a number average molecule weight below 500 Da, at least one site of carbon-carbon unsaturation, and at least one functional group which is oxyalkylatable by alkylene oxide in the presence of a double metal cyanide complex catalyst wherein said initiator molecule has not more than one free carboxylic acid group;
- b) oxyalkylating said initiator molecule with one or more alkylene oxides in the presence of an effective amount of a double metal cyanide complex catalyst and under conditions effective to form such a polyoxyalkylene polyether; and
- c) recovering a hydroxyl- and unsaturation-functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether and (b)

not more than 0.020 eq/g unsaturation beyond that of initiator-molecule derived unsaturation."

Claims 2-10 were dependent claims.

Claim 11-18 were directed to a process for the preparation of a polymer according to any of claims 1-10.

Claims 19-24 were directed to a copolymer obtainable by copolymerising a polyoxyalkylene polyether according claims 1-10 or prepared according to claims 11-18 with an ethylenically unsaturated comonomer. Claims 25 and 26 were corresponding process claims.

Claims 27 and 28 were directed to cement or concrete compositions containing a polymer of claims 20-24 or prepared according to claims 25 or 26.

Claim 29 was directed to a method of increasing the fluidity of a hydraulic cement composition comprising adding a specified quantity of a copolymer according to any of claims 20 to 24 or prepared in accordance with claims 25 to 26.

Claim 30 was directed to a polymer polyol and read as follows:

"A polymer polyol preparable by:

- a) selecting one or more hydroxyl-functional base polyol(s) having a nominal functionality of 2 or more in the aggregate;
- b) adding to said hydroxyl-functional base polyol(s) an

effective stabilizing amount of one or more polyethers selected from:

- b)i) a polyether according to any of claims 1 to 10 or prepared according to any of claims 11 to 18;
- b)ii) a preformed stabilizer prepared by the polymerization of one or more vinyl monomers in the presence of a polyether according to any of claims 1 to 10 or prepared according to any of claims to 11 to 18; or
- b)iii) mixtures thereof and
- c) polymerizing one or more vinyl monomers *in situ* in said base polyol(s) in the presence of said polyether to prepare a stable, low viscosity vinyl polymer dispersion containing from 10 weight percent to 70 weight percent of vinyl polymer solids."

Claim 31 was a corresponding independent process claim.

Claim 32 was directed to the use of a polyoxyalkylene polyether according to claims 1 to 10 or prepared according to claims 11 to 18 as a polymer polyol stabiliser or preformed precursor.

Claim 33 was directed to the use of a copolymer according to any of claims 19 to 24 or prepared according to any of claims 25 to 27 as a cement or concrete additive.

III. Notices of opposition against the patent were filed on 19 April 2005 (opponent 1) and 21 April 2005 (opponent 2). Both opponents invoked the grounds of opposition pursuant to Art. 100(a) EPC in connection with Art. 54 EPC (lack of novelty) and Art. 56 EPC (lack of inventive step).

*Inter alia* the following documents were cited in support of the oppositions:

D4: US-A-4 126 527  
D6: US-A-4 670 512  
D10: US-A-5 223 583  
D11: WO-A-95/16643  
D12: US-A-5 470 813  
D13: US-A-5 482 908  
D14: US-A-5 494 957  
D15: US-A-5 545 601.

IV. The decision of the opposition division was based on the claims of the patent as granted as the main request and five sets of claims forming auxiliary requests, all filed with letter dated 11 January 2008. The patent was maintained on the basis of the second auxiliary request, claim 1 of which read: (the **additions** and ~~deletions~~ compared to claim 1 as granted being shown as indicated):

"A hydroxyl-functional and unsaturation-functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether, ~~and~~ (b) ~~not more than 0.020~~ **less than 0.010** meq/g unsaturation beyond that of the initiator-molecule derived unsaturation, **(c) a polydispersity from 1.0 to 1.5, and (d) a molecular weight greater than 2000 Da**, preparable by:

a) selecting an initiator molecule having a number average molecule weight below 500 Da, at least one site of carbon-carbon unsaturation, and at least one functional group which is oxyalkylatable by alkylene oxide in the presence of a double metal cyanide complex

catalyst wherein said initiator molecule has not more than one free carboxylic acid group;

b) oxyalkylating said initiator molecule with one or more alkylene oxides in the presence of an effective amount of a double metal cyanide complex catalyst and under conditions effective to form such a polyoxyalkylene polyether; and

c) recovering a hydroxyl- and unsaturation-functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether ~~and~~ (b) ~~not more than 0.020~~ **less than 0.010** meq/g unsaturation beyond that of initiator-molecule derived unsaturation, **(c) a polydispersity from 1.0 to 1.5, and (d) a molecular weight greater than 2000 Da;** wherein said alkylene oxide is selected from propylene oxide, 1,2- and 2,3-butylene oxide, C6-30 alpha-olefin oxides, oxetane, glycidol, halogenated alkylene oxides, and mixtures thereof, and mixtures of propylene oxide and ethylene oxide."

Claims 2-7 corresponded to granted claims 2-7. Claim 8 corresponded to granted claim 10, adapted to take account of the amendments made to claim 1. Claim 9 corresponded to claim 11 as granted, the product properties being amended for agreement with claim 1. Claims 10-31 corresponded to granted claims 12-33 with the dependencies adapted.

V. According to the decision:

(a) The subject-matter of the main request was anticipated by D4, D6 and D11 so that it did not meet the requirements of Art. 54 EPC.

(b) The first auxiliary request was considered to comply with Art. 123(2) and Art. 123(3) EPC and to be novel. With respect to Art. 56 EPC, as the patent in suit dealt with two technical fields (concrete additives and polyol stabilisers) the opposition division considered it appropriate to select different documents as the closest state of the art for each of these fields. Starting from D11 as the closest state of the art for the concrete additives, the distinguishing features were the amount of unsaturation and the polydispersity of the polyoxyalkylene polyether. For lack of any proven effect due to those differences, the problem to be solved was to provide alternative polyoxyalkylene polyethers. In view of D10, which taught the use of DMC catalysts for preparing polyoxyalkylene polyethers as well as the use of unsaturated initiators, the combination of D11 with D10 rendered the claimed subject-matter obvious. The first auxiliary request did therefore not meet the requirements of Art. 56 EPC.

(c) Regarding the second auxiliary request, the requirements of Art. 123(2), 123(3) and 54 EPC were satisfied.

With respect to Art. 56 EPC, the same two technical fields as in the first auxiliary request were recognised (concrete additives and polyol stabilisers).

The closest prior art for the subject-matter of claims 1-28 [*sic*] and 32 [*sic*], i.e. the claims



relating to the hydroxyfunctional polyether and cement compositions was D11. The claimed subject-matter was distinguished therefrom by the level of unsaturation beyond that of the initiator, i.e. lower than 0.010 meq/g, and the polydispersity of 1.0-1.5. The objective technical problem was the provision of polyoxyalkylene ethers exhibiting these properties. This was neither disclosed nor suggested by the prior art. As the specified level of unsaturation could not be obtained with the DMC catalysts of D10, the skilled person would not combine D10 and D11.

The specified levels of unsaturation could only be obtained with highly active DMC catalysts such as disclosed in D12, D13 and D15. Those documents did not mention unsaturated initiators. The skilled person would have had no motivation to choose the highly reactive DMC catalysts so that D11 would not be combined with any of D12, D13 or D15.

Regarding claims 1-18 and 29-31 [*sic*], i.e. the subset of claims directed *inter alia* to polymer polyols, it was held that the closest prior art was D14, which disclosed a process for preparing polymer polyols involving the use as a stabilizer of a polymer having an unsaturated end group. Since D12 was silent with respect to the use of unsaturated initiators, there was no incentive to combine D14 and D12. The only document dealing with an unsaturated initiator and a DMC catalyst was D10. Since D10 however employed low activity DMC catalysts, it was not obvious that the combination of D14 and D10 would lead to polyethers having an unsaturation level as

specified in the claim. Hence starting from D14 the skilled person would have had no motivation to choose the highly reactive DMC catalysts. It was questionable to combine extremely reactive DMC catalysts with an unsaturated initiator.

Accordingly it was held that the patent in suit could be maintained in amended form on the basis of the second auxiliary request filed with the letter dated 11 January 2008.

VI. On 24 July 2008 opponent 2 lodged an appeal against the decision, the prescribed fee being paid on the same date. The statement of grounds of appeal was submitted on 16 September 2008.

VII. The patent proprietor - now the respondent - replied with a letter dated 6 April 2009. The main request was for the appeal to be dismissed. Three sets of claims forming first to third auxiliary requests were submitted.

Claim 1 of the first auxiliary request differed from the main request - i.e. the set of claims upheld by the opposition division - in that in claim 1 the initiators were specified, the following phrase having been added to the end of claim 1:

"and said initiator molecule comprises acrylic acid, methacrylic acid, a hydroxyalkylacrylate or a hydroxyalkylmethacrylate".

Claims 3 and 5 had been deleted. Claim 7, corresponding to claim 9 of the main request, was amended

analogously. Claims 8 to 29 corresponded to claims 10 to 31 of the main request, appropriately adapted.

The second auxiliary request differed from the first auxiliary request in that in section b) of claims 1 and 7 (i.e. that part relating to "oxyalkylating said initiator molecule"), prior to the phrase "and under conditions..." the feature "and in the presence of one or more vinyl polymerisation inhibitors" had been introduced.

Claim 8 had been deleted and the subsequent claims renumbered.

- VIII. On 23 February 2012 the Board issued a summons to attend oral proceedings. In an accompanying communication the Board *inter alia* raised a number of formal objections with respect to the third auxiliary request submitted with the rejoinder to the statement of grounds of the appeal.
- IX. With a letter dated 18 May 2012 the appellant made further submissions.
- X. Opponent 1 did not make any submissions during the written appeal proceedings.
- XI. With a letter dated 21 May 2012 the respondent submitted amended sets of claims forming a corrected third, and fourth and fifth auxiliary requests.

Claim 1 of the third auxiliary request read as follows:

"1. A polymer polyol preparable by:

- A) selecting one or more hydroxyl-functional base polyol(s) having a nominal functionality of 2 or more in the aggregate;
- B) adding to said hydroxyl-functional base polyol(s) an effective stabilizing amount of one or more polyethers; and
- C) polymerizing one or more vinyl monomers *in situ* in said base polyol(s) in the presence of said polyether to prepare a stable, low viscosity vinyl polymer dispersion containing from 10 weight percent to 70 weight percent vinyl polymer solids;

wherein said polyether is selected from:

- i) a hydroxyl-functional and unsaturation-functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether, (b) less than 0.010 meq/g unsaturation beyond that of the initiator-molecule derived unsaturation, (c) a polydispersity from 1.0 to 1.5, and (d) a molecular weight greater than 2000 Da, preparable by:

- a) selecting an initiator molecule having a number average molecular weight below 500 Da, at least one site of carbon-carbon unsaturation, and at least one functional group which is oxyalkylatable by alkylene oxide in the presence of a double metal cyanide complex catalyst wherein said initiator molecule has not more than one free carboxylic acid group;

- b) oxyalkylating said initiator molecule with one or more alkylene oxides in the presence of an effective amount of a double metal cyanide complex catalyst and under conditions effective to form such a polyoxyalkylene polyether; and

- c) recovering a hydroxyl- and unsaturation-

functional polyoxyalkylene polyether having (a) not more than one initiator molecule per molecule of polyether, (b) less than 0.010 meq/g unsaturation beyond that of initiator-molecule derived unsaturation, (c) a polydispersity from 1.0 to 1.5, and (d) a molecular weight greater than 2000 Da;

wherein said alkylene oxide is selected from propylene oxide, 1,2- and 2,3-butylene oxide, C6-30 alpha-olefin oxides, oxetane, glycidol, halogenated alkylene oxides, and mixtures thereof, and mixtures of propylene oxide and ethylene oxide;

- ii) a preformed stabilizer prepared by the polymerization of one or more vinyl monomers in the presence of a polyether i); or
- iii) mixtures thereof."

Claim 9 of the third auxiliary request was directed to a polymer polyol according to any preceding claim, which polyether was prepared by a process the definition of which was *verbatim* the corresponding part of claim 1, i.e. "a) selecting an initiator molecule [...] mixtures of propylene oxide and ethylene oxide".

The fourth and fifth auxiliary requests consisted of claims 1-6 of the first and second auxiliary requests respectively.

XII. Oral proceedings were held before the Board on 20 June 2012 in the presence of the appellant and the respondent. Opponent 1 did not attend.

XIII. The arguments of the appellant can be summarised as follows:

Main request

- (a) The claims according to the main request did not meet the requirements of Art. 56 EPC.

The patent in suit only provided examples relating to manufacture of the polyether polyols. As there were no examples demonstrating the uses of the polyether polyols in cement compositions or in the preparation of polymer polyols these uses had to be disregarded in the assessment of inventive step.

- (b) Although D11 was considered to be the closest prior art in the decision under appeal, in fact D10 was the closest state of the art. D10 disclosed low unsaturation polymers prepared from unsaturated initiators - unsaturated acids and alcohols being mentioned. The example employed allyl alcohol and disclosed all features of operative claim 1 except for the unsaturation content. Even if not explicitly stated in example 1 of D10, it had to be concluded that the catalyst had an organic ligand. Furthermore, the polyether produced in D10 was clearly disclosed as a product *per se* notwithstanding that it served as an intermediate product.

The objective technical problem to be solved with respect to D10 was to provide polyethers with lower unsaturation content and fewer byproducts. From D12, D13 and D15 DMC catalysts were known which were stated to provide polyethers with very low unsaturation as well as low molecular weight

distribution, which was indicative of a low content of byproducts. This last mentioned characteristic emerged in particular from the data presented in Table 1 of D15. There was no statement in D12, D13 or D15 cautioning against the use of the catalysts of these documents with unsaturated starters. On the contrary, D12 and D15 even contained an explicit reference to D10, which showed that there would be no obstacle to using said catalysts with unsaturated starters.

- (c) Alternatively, starting from D11 as the closest prior art, this document disclosed compounds A5 and A6 which had a single site of unsaturation, meaning that they would not undergo crosslinking, so that this aspect of the problem as set out in the patent in suit had already been solved by D11. Hence the problem solved with respect to D11 was that a particular - alternative - method had been selected to prepare the known products. The method specified in the claims was however a known, standard method. Although properties such as polydispersity were not disclosed in D11 these were known to arise from the use of DMC catalysts, e.g. as taught in D10, D12, D13 and D15, and were of no relevance for the use in cement.
- (d) For those reasons, the main request was not inventive.

#### First auxiliary request

- (e) As D11 disclosed the use of an acrylic acid initiator, the specification of this initiator in

claim 1 of the first auxiliary request did not provide any further distinction. Consequently the same arguments applied as for the main request.

#### Second auxiliary request

- (f) It was standard practice to employ an inhibitor in order to be able to carry out the reaction at higher temperatures. This was taught for example in D4. The second auxiliary request added nothing further than this obvious measure.

#### Third auxiliary request

- (g) Claim 9 merely repeated features present in claim 1 and therefore was redundant. Furthermore the dependency of claim 11 was incorrect since claim 1 was not directed to the polyether (i). Consequently the third auxiliary request did not meet the requirements of Art. 84 EPC.

#### Fourth and fifth auxiliary requests

- (h) The arguments given for the first and second auxiliary requests applied.

XIV. The arguments of the respondent can be summarised as follows:

#### Main request

- (a) D11 was the closest prior art, in particular examples A5 and A6 thereof, relating to compounds of propylene oxide. The distinguishing feature of



the claimed subject-matter over D11 was the well-defined nature of the polymers, i.e. the low unsaturation and narrow molecular weight distribution. A polymer with a single site of unsaturation and no chain unsaturation was required in order to avoid crosslinking reactions. D11 provided no indication of how such a polymer could be formed. Normally if acrylic acid was treated with base followed by addition of ethylene oxide and/or propylene oxide, a product with broad molecular weight distribution resulted. The adducts A5 and A6 of D11 potentially would undergo isomerisation to produce e.g. allyl alcohol groups or undergo transesterification. Hence it was excluded that the properties of operative claim 1 were implicitly exhibited by the polymers of D11. There was furthermore doubt that using highly reactive DMC catalysts with unsaturated initiators, in particular acrylic acid, would lead to useful products. D12, D13 and D15, relating to highly active DMC catalysts, disclosed that the catalysts functioned with a particular class of starter. However it could not be inferred from D12, D13 and D15 that the catalysts of these documents would work with any other starter. There was no pointer in the prior art to combine the teaching of D11 with that of D12, D13 and D15.

- (b) D10 disclosed polyether polyols only as intermediate products, which were employed to provide compounds having terminal unsaturation that were then hydrosilylated. Consequently D10 disclosed a completely different chemistry to that

of the patent in suit and could not render the claimed subject-matter obvious.

- (c) Therefore, the main request was inventive.

First auxiliary request

- (d) There was no pointer to the present specific starters (e.g. acrylic acid) in the prior art and no indication that these would be compatible with the specified catalyst.

Second auxiliary request

- (e) The presence of the inhibitor exerted an effect on the product since it not only prevented the acrylic acid from undergoing self-polymerisation but also prevented other side reactions, e.g. involving the addition reaction of ethylene oxide and propylene oxide to short chain fragments of acrylic acid, thus leading to lower polydispersity than without the inhibitor. This effect was not reported or foreshadowed in the cited documents.

Third auxiliary request

- (f) The third auxiliary request had been amended compared to the version submitted with the response to the statement of grounds of appeal to address the matters raised in the communication of the Board.

#### Fourth and fifth auxiliary requests

(g) The arguments in respect of the first and second auxiliary requests were invoked.

XV. The appellant (opponent 2) requested that the decision under appeal be set aside and that European patent no. 1 012 203 be revoked.

XVI. The respondent (patent proprietor) requested that the appeal be dismissed or, alternatively, to maintain the patent in amended form on the basis of one of the sets of claims according to the first or second auxiliary request, filed with letter of 6 April 2009, or the third to fifth auxiliary request, filed with letter of 21 May 2012.

### **Reasons for the Decision**

1. The appeal is admissible.
2. Inventive step was the only issue in appeal and the board sees no reason to take a different view.
3. *Main request*
  - 3.1 The closest prior art.
    - 3.1.1 The patent in suit relates to the preparation of functionalized polymers, in particular to functionalised polyoxyalkylene polyethers, processes for their preparation and their use in the field of

cement additives and as polymer polyol stabilisers (paragraph [0001]).

D11 relates to admixtures for concrete and was, according to the decision under appeal, the closest prior art as far as the aspect of cement compositions was concerned. Also the respondent considered D11 as the closest state of the art.

D11 discloses an admixture for concrete comprising a copolymer prepared by copolymerising as one monomer an oxyalkylene derived from an unsaturated acid with further unsaturated materials (claim 1). Among the possible examples of compounds for this comonomer are those identified as A5, a block adduct of acrylic acid with 10 molecules of propylene oxide and 135 molecules of ethylene oxide or A6, a block adduct of acrylic acid with 135 molecules of ethylene oxide and 5 molecules of propylene oxide (paragraph bridging pages 18 and 19). From the given molecular composition it can be calculated that the molecular weights of these compounds fall under operative claim 1. The polydispersity and content of unsaturation beyond that derived from the initiator are however not disclosed. Accordingly, the subject-matter of claim 1 of the main request is distinguished from the disclosure of D11 by those features.

### 3.2 The technical problem solved

The examples of the patent in suit demonstrate the preparation of various polyethers. However in several cases the products do not fall within the scope of claim 1 as the molecular weight is too low. There are

no examples showing the use of the polyethers either as an additive for cement compositions or as a stabiliser in the production of polymer polyols, nor any comparative examples which would demonstrate any benefit of the claimed polyethers in the indicated uses. Hence, there is no evidence of any technical effect associated with the distinguishing features of the claimed subject-matter over D11. Accordingly the technical problem solved with respect to D11 has to be formulated as to provide further unsaturated polyethers regardless of their suitability for any particular uses, which problem the examples show has been effectively solved.

### 3.3 Obviousness

3.3.1 D12, D13 and D15 all disclose double metal cyanide catalysts which provide polyethers with very low unsaturation and a very low content of low molecular weight impurities (claim 1 of each document).

According to D12, col. 6, lines 40-41, its DMC catalysts are highly active compared to conventional DMC catalysts; give "exceptionally low unsaturation, consistently less than about 0.007 meq/g" (col 7, lines 2-4) and give a lower content of low molecular weight polyol impurities than conventional catalysts (col. 7 lines 19-28).

D13 mentions the "exceptional activity" of its DMC catalysts (col.1, line 6-10, col.2, lines 49-57, col.6, lines 33-34), as does D15 (col.1, lines 5-9, col.4 lines 29-39). D15 also discloses the low unsaturation of the polyols produced with its catalyst (col.1, lines

5-9, col.4, lines 29-39) as well as their low polydispersities, of the order of 1.07 to 1.20, (Table 1) which is consistent with the stated low content of low molecular weight impurities.

- 3.3.2 The respondent argued that the skilled person would not contemplate using the highly active catalysts disclosed in D12, D13 and D15 with initiator molecules containing unsaturation such as that present in the compounds of D11.

However there is no discussion in any of D12, D13 or D15 that could lend support to this argument. Nor has the respondent provided any other documents which would support this contention. Accordingly the Board is unable to identify in the cited prior art any teaching which would prevent the skilled person from employing the catalysts of D12, D13 or D15 with initiators containing unsaturated groups.

Consequently, for the skilled person seeking to provide further unsaturated polyethers starting from D11, it would be obvious to employ the catalysts as disclosed in D12, D13 and D15 in view of the reported characteristics of said catalysts.

- 3.3.3 Accordingly, the subject-matter of claim 1 of the main request is obvious starting from D11 in view of D12, D13 and/or D15.

- 3.4 One would not arrive at any other conclusion starting from D10 as the closest prior art document, as the appellant did. D10 discloses a process for an unsaturated group-terminated polyoxyalkylene oxide

using a DMC catalyst (claim 1). In example 1 allyl alcohol is used as an initiator in combination with a DMC catalyst falling under the terms of claim 1 of the present main request. The products have a high molecular weight and a narrow molecular weight distribution (col.1, lines 54-62). The level of unsaturation is not disclosed. Accordingly, the subject-matter of claim 1 of the main request is distinguished from the disclosure of D10 by the level of unsaturation.

3.4.1 As the patent in suit does not show any effect due to that distinguishing feature, the problem solved vis-à-vis D10 does not differ from the one formulated when starting from D11, namely to provide further unsaturated polyethers.

3.4.2 As there is no evidence that the skilled person would be prevented from using the catalysts according to either of D12, D13 or D15 in the process of D10, the reasoning starting from D11 as the closest prior art (point 3.3 above) is also valid using D10 as the closest prior art.

3.5 Therefore, the subject-matter of claim 1 of the main request is also obvious starting from D10 in view of D12, D13 and/or D15.

3.6 Since the main request does not meet the requirements of Art. 56 EPC, it has to be refused.

4. *First auxiliary request*

4.1 In claim 1 of the first auxiliary request the initiators are restricted to specific compounds, one of which is acrylic acid. This is the initiator that is present in the compounds A5 and A6 of D11. Accordingly, claim 1 of the first auxiliary request does not introduce any additional distinction over the closest prior art D11 compared to the main request, with the consequence that the conclusions reached in respect of the main request also apply to the first auxiliary request.

Taking D10 as the closest state of the art does not lead to any different conclusion. The further distinguishing feature compared to the main request, i.e. the restriction of the initiator to specific compounds *inter alia* acrylic acid and methacrylic acid is suggested by D10 which discloses in column 2 line 33-34 that an unsaturated carboxylic acid can serve as the initiator. There is no evidence that the specific unsaturated acids defined in claim 1 give rise to any unexpected technical effect. The definition of these unsaturated carboxylic acids therefore constitutes a further obvious, arbitrary modification of the subject of D10 in order to solve the problem of providing further polyoxyalkylene polyethers.

The first auxiliary request therefore does not meet the requirements of Art. 56 EPC and is refused.



5. Second auxiliary request

- 5.1 Claim 1 of the second auxiliary request differs from the first auxiliary request in that it additionally requires the presence of an inhibitor during the production process of the claimed polyether.

According to the respondent, the presence of the inhibitor would manifest itself in the properties of the product since it would result in retention of the terminal unsaturated groups and, due to inhibiting the reaction of these groups, result in a lower molecular weight polymer.

- 5.2 However, as D4 teaches (col. 1 line 50ff), maintaining vinyl unsaturation in the reaction of an unsaturated hydroxy ester and an epoxide is known and can be accomplished in two ways. One is by employing a low reaction temperature. Alternatively, if an inhibitor is included it is possible to carry out the reaction at a higher temperature.

The conclusion that has to be drawn from the teaching of D4 is that the presence of the inhibitor affects the efficiency of the process leading to the product. However, D4 does not contain any indication that the presence of an inhibitor would lead to any modification of the product itself nor is there any other evidence on file which would lead to such a conclusion.

- 5.3 The specification of the inhibitor according to the second auxiliary request therefore does not introduce any features in respect of the product in addition those of the main request. The conclusions as indicated

for the main request thus apply also to the second auxiliary request.

Consequently the second auxiliary request does not meet the requirements of Art. 56 EPC and has to be refused.

6. *Third auxiliary request*

6.1 Claim 1 of the third auxiliary request is based on claim 30 of the patent as granted whereby the reference therein to claim 1 has been replaced by an explicit recitation of the relevant passage.

6.2 Claim 9 of the third auxiliary request merely repeats *verbatim* the features of claim 1 thereof which were derived from granted claim 1, but it contains no additional technical features. Therefore, it is not apparent which further restriction the features of claim 9 impose compared to the subject-matter of claim 1 of the third auxiliary request, meaning that the claim introduces an unclarity.

6.3 The third auxiliary request therefore does not meet the requirements of Art. 84 EPC and is refused.

7. *Fourth auxiliary request*

The fourth auxiliary request is restricted to claims 1-6 of the first auxiliary request. The arguments set out above in respect of claim 1 of the first auxiliary request apply to claim 1 of the fourth auxiliary request.

The fourth auxiliary request is refused.

8. *Fifth auxiliary request*

The fifth auxiliary request is restricted to claims 1-6 of the second auxiliary request. The arguments set out above in respect of claim 1 of the second auxiliary request apply to claim 1 of the fifth auxiliary request.

The fifth auxiliary request is refused.

**Order**

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

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar

The Chairman

E. Goergmaier

B. ter Laan