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Datasheet for the decision
of 16 October 2025

Case Number: T 1719/21 - 3.3.03

Application Number: 13767543.5

Publication Number: 2833415

IPC: H01L31/048, C08L23/08

Language of the proceedings: EN

Title of invention:
SOLAR CELL SEALING MATERIAL AND SOLAR CELL MODULE

Patent Proprietor:
Mitsui Chemicals, Inc.
Mitsui Chemicals Tohcello, Inc.

Opponent:
Borealis GmbH

Relevant legal provisions:
RPBA 2020 Art. 12(4)
EPC Art. 83, 56

Keyword:

Amendment to case - inventive step objection admissibly raised and maintained (yes)
Sufficiency of disclosure - (yes)
Inventive step - closest prior art involving the use of a commercial product - realistic starting point for the invention in view of G 1/23 (yes) - non obvious alternative and non obvious improvement

Decisions cited:

G 0001/92, G 0003/14, G 0001/23, T 0023/11, T 1833/14, T 0602/24

Catchword:

It cannot be taken from the reasoning of the Enlarged Board in G 1/23 that where a modification of a non-reproducible but commercially available product as such is necessary, then the non-reproducible product does not form the closest prior art. What needs to be modified is part of the inventive thinking of the skilled person in order to solve the problem addressed, but not a consideration concerning the selection of that starting point.

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Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 1719/21 - 3.3.03

DECISION
of Technical Board of Appeal 3.3.03
of 16 October 2025

Appellant: (Opponent)	Borealis GmbH Trabrennstrasse 6-8 1020 Vienna (AT)
Representative:	Dehns 10 Old Bailey London EC4M 7NG (GB)
Respondent: (Patent Proprietor 1)	Mitsui Chemicals, Inc. 2-1, Yaesu 2-chome Chuo-ku Tokyo 104-0028 (JP)
Respondent: (Patent Proprietor 2)	Mitsui Chemicals Tohcello, Inc. 7, Kandamitoshiro-cho Chiyoda-ku Tokyo 101-8485 (JP)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 23 July 2021 concerning maintenance of the European Patent No. 2833415 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	F. Rousseau
	A. Bacchin

Summary of Facts and Submissions

I. The appeal lies from the interlocutory decision of the opposition division according to which European patent No. 2 833 415 as amended according to the claims of the Main Request submitted with letter of 23 April 2021 and a description adapted thereto met the requirements of the EPC.

II. The decision was taken having regard *inter alia* to the following documentary evidence:

D3: US 2005/0215737 A1
D4: WO 2008/036708 A2
D7: ENGAGE™ 8400, technical information, Dow, Rev. 7 September 2011
D7a: ENGAGE™ 8407, technical information, Dow, Rev. 17 May 2011
D7b: ENGAGE® polyolefin elastomer, Product Information, DuPont Dow Elastomers, published August 2015
D8: US 5,986,028
D9: WO 2010/140343 A1 and its English translation US 2012/073631 A1 (D9')
D10a: Analysis report, 26 December 2013, F content of ENGAGE™ 8407 and ENGAGE™ 8200
D10d: Attestation on test and analysis, 18 May 2016, fluorine and aluminium contents of ENGAGE™ 8400 and 8407
D11: JP 2012-38856 A and Patent Translate translation thereof D11'
D12: BS EN 1122:2001 Plastics - Determination of cadmium - Wet deposition method
D13: E. Wieteska et al, The Role of Sample Pre-Treatment in Analysis of Aluminium Traces in Food by

GFAAS, Polish Journal of Environmental Studies Vol. 8, No. 3 (1999), 189-196

III. As far as relevant to the present case, the following conclusions were reached in the decision under appeal:

(a) Sufficiency of disclosure was acknowledged.

(b) Novelty over each of Example II and Comparative Example VI of D3 was acknowledged. ENGAGE® 8200, 8400/8407 as used in D4 were, even in the light of D8, not reproducible and thus were not considered as made available to the public.

(c) D11 was considered to be the closest prior art and the subject-matter of claim 1 differed therefrom by a content of F in the copolymer to be below 10 ppm. That content had been shown to be associated with a reduction of the volume resistivity of the encapsulating material, which effect was not derivable from the cited prior art. An inventive step was therefore acknowledged.

IV. An appeal against that decision was lodged by the opponent (appellant). Written submissions including a statement of grounds of appeal and a reply thereto by the patent proprietor (respondent) were filed by the parties, Auxiliary Requests 1 to 11 being filed with the reply to the statement of grounds of appeal. Additional submissions regarding the substance of the case were filed by both parties after issuance of decision G 1/23 of the Enlarged Board of Appeal, whereby the additional submissions of the respondent included new auxiliary requests.

V. In preparation of the oral proceedings, a communication pursuant to Article 15(1) RPBA conveying the Board's provisional opinion was issued.

VI. During the oral proceedings held on 16 October 2025 with the participation of both parties the respondent withdrew all claim requets, except for Auxiliary Request 2 submitted with the rejoinder.

VII. The final requests of the parties were as follows:

The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of Auxiliary Request 2 filed with the reply to the statement of grounds of appeal.

VIII. The claims of Auxiliary Request 2 which are relevant for the present decision are claims 1 and 2 which read as follows:

"1. An encapsulating material for solar cell comprising:
an ethylene/α-olefin copolymer,
wherein the ethylene/α-olefin copolymer contains a fluorine element, and
the content of the fluorine element in the ethylene/α-olefin copolymer, which is determined using a combustion method and an ion chromatograph method, is equal to or less than 3.0 ppm.

2. The encapsulating material for solar cell according to claim 1,

wherein a content of an aluminum element in the ethylene/α-olefin copolymer, which is determined using an ICP emission analysis, is equal to or less than 20 ppm."

IX. The parties' arguments, in so far as they are pertinent for the present decision, may be derived from the reasons for the decision below. They were directed to the following issues:

(a) Sufficiency of disclosure of the encapsulating material according to claims 1 and 2.

(b) Inventive step of the encapsulating material of claim 1 starting from the encapsulating material exemplified in the experimental part of D11.

(c) Inventive step of the encapsulating material of claim 1 starting from Example 3 of D4 and admittance of that objection.

Reasons for the Decision

Preliminary remark

1. Operative claim 1 defines that the ethylene/α-olefin copolymer comprised in the encapsulating material contains a fluorine element whose content as determined using a combustion method and an ion chromatograph method, is equal to or less than 3 ppm.

Although this is not stated in claim 1, it was common ground that said level of fluorine originates from the catalytic system used to synthesize the ethylene/α-olefin copolymer. In this respect, as indicated in paragraphs [0018], [0028] and [0064] of the patent in suit fluorine containing cocatalysts used for reacting with the metallocene catalyst so as to form an ion pair remain in the ethylene/α-olefin copolymer after polymerization. This fact was communicated to the parties with the preliminary opinion of the Board (point 10) and never disputed.

Sufficiency of disclosure

Missing essential features

2. The appellant's objection was originally directed against claim 1 of the former Main Request, corresponding to claim 1 of Auxiliary Request 2 but defining an upper limit for the content of fluorine element equal to or less than 10 ppm. The appellant had submitted that the subject-matter of claim 1 of said Main Request would lack enablement over the whole scope claimed, if the ethylene/α-olefin copolymer material of Comparative Example VI of D3, which undisputedly comprised a F content of maximum 5.3 ppm, were considered not to anticipate claim 1 of the Main Request because it were unsuitable as encapsulating material for solar cell. In that case claim 1 would not define the features which are essential to produce an encapsulating material (statement of grounds of appeal, pages 3 and 4, section 4.5.2). This objection was maintained in relation to Auxiliary Request 2 (appellant's letter of 12 May 2023, page 6, fourth paragraph).

The Board indicated in the preliminary opinion sent in preparation for oral proceedings that the requirement that a claim should contain all essential features is not a substantive requirement, in particular concerning sufficiency of disclosure, but a formal requirement of the independent claims under Article 84 EPC, derivable from Rule 43(3) EPC, according to which the features of the independent claims of the application upon filing are those which the applicant considers essential for the patent protection sought (T 0602/24, Reasons 2.6.1 to 2.6.3), which formal requirement is therefore not open to examination in opposition proceedings. The appellant did not react to this conclusion which is maintained by the Board. Already for this reason, the appellant's objection concerning the absence of essential features in operative claim 1 of Auxiliary Request 2 fails to convince.

Moreover, the appellant did not contest that the teaching of the patent in suit, in particular regarding the synthesis of the ethylene/α-olefin copolymer and the additives it could incorporate, would be sufficient to prepare a material which is suitable for an encapsulating material for solar cell. In other words, the skilled person starting with an ethylene/α-olefin copolymer material corresponding to that of Comparative Example VI of D3 in order to put into practice the present invention would find in the present specification, if needed, sufficient information on how to modify that material by using appropriate additives, e.g. such as those providing crosslinking and/or stabilization of the composition.

F content

3. The appellant's objection relating to the feature defining the F content (statement of grounds of appeal, sections 18-26) was essentially as follows. In the appellant's view claim 1 needed to enable the formation

of an encapsulating material comprising a polymer with an F level as low as 0.1 ppm or 0.0001 ppm as both those values would be within the scope of the claims. This, however, would require that such amounts were measurable, which having regard to the indication in D10a that the F detection limit is 1 ppm, would not be possible. The appellant contended that the claim needs a lower limit to prevent the scope of the claim changing with time as analytical techniques improve. If ENGAGE™ 8200 disclosed in D10a could be distinguished on the basis that the F level is less than 1 ppm and hence undetectable, then the claim would need to be construed such that the minimum F level is 1 ppm. This would raise the question as to whether with time passing ENGAGE™ 8200 having for example an F level of 0.1 ppm would become suddenly novelty destroying for claim 1. On that basis the skilled person would be unable to prepare an encapsulating material having such a low amount of F and the claimed invention could not be performed over the whole range claimed.

This is not convincing.

As noted by the respondent (rejoinder, page 7, section (32)) a determination by ion-chromatography, which is the method defined in operative claim 1, must have certain limits inherent to the methods available to the skilled person at the date of filing or priority of the patent in suit, which is the relevant date to assess the meaning of the terms comprised in operative claim 1. This implies that the lower limit for the amount of F in the copolymer cannot be below the detection limit of the ion-chromatography which was usual at that date. Having regard to ENGAGE™ 8200 whose content of fluorine element, if any is present, is argued to be below the detection limit using the technique defined in operative claim 1, this simply means that ENGAGE™ 8200 was not proven to comprise fluorine element.

The appellant's argument that this approach would raise the question as whether with time passing ENGAGE™ 8200 having for example an F level of 0.1 ppm would become suddenly novelty destroying for claim 1 is not pertinent. This is because the technical contribution to the art which would justify the extent of the patent monopoly, which results from the definition of the subject-matter defined in the claims, is to be judged based on the knowledge which was available to the skilled person at the date of filing or priority of the patent under examination.

Hence, any knowledge which was not accessible to the skilled person at the date of filing or priority of the patent in suit, for example a given analysis method, cannot be taken into account as part of the prior art for evaluating such technical contribution, for example when assessing the criteria of novelty or inventive step. This is supported by decision G 1/23, Reasons 98, according to which "*If the product is available for analysis, the results of such an analysis do not even pose the question of reproducibility, at least as long as the methodology of the analysis itself also belongs to the common general knowledge of the skilled person or is at least sufficiently disclosed in the state of the art*" (emphasis added by the Board).

In the present case, whether or not the limit of detection of the fluorine content has been established is therefore a mere issue of clarity concerning a feature present in the claims as granted and which cannot be objected according to the ruling of G 3/14.

Furthermore, the level of fluorine is directly related to the amount of cocatalyst components present in the ethylene/α-olefin copolymer (see point 1 above). In this respect it is common general knowledge that the catalyst and cocatalyst residues remain in the polymer and that their amount in the polymer depends on the polymerization activity, which can be varied by changing the reaction conditions.

In view of the foregoing, the Board has no reason to conclude that the content of fluorine defined in operative claim 1 constitutes an obstacle for the skilled person desiring to carry out the claimed invention.

Al content

4. The objection of the appellant concerns the ability of the skilled person to determine whether a given ethylene/α-olefin copolymer has an Al content within the range defined in claim 2.

It is uncontested that a method to measure that content is given in paragraph [0185] of the specification. The appellant's objection is that the accuracy of the measurement is not ensured due to the absence of any indication of specific experimental conditions to be employed for this method (statement of grounds of appeal, sections 29 to 36). D12 and D13 would demonstrate that the determination of metal content in a sample, including Al-content, is highly dependent on the nature of the wet decomposition method used. In addition, the patentee would not have been able to identify a standard test method available at the priority date for determining the Al content of a polymer, nor would the patent identify such a method (statement of grounds of appeal, section 34).

Similarly to the objection relating to the content of F, the appellant's submissions boils down to the argument that the boundaries of granted claim 2 are not clearly defined, which is a matter of clarity, which, in view of the ruling of G 3/14, cannot be examined.

Furthermore, the appellant does not contest that the patent in suit comprises examples showing how to obtain a copolymer having such an amount of Al.

Moreover, similarly to what is already mentioned above in relation to the content of F, it is common general knowledge that the Al containing cocatalyst remains in the polymer and that its concentration depends on the polymerization activity, which can be varied by changing the reaction conditions.

This can be illustrated with Synthesis Example 1A of the specification. For that example an amount of Al in the final polymer of 8.3 ppm can be calculated, taking for the calculation the rate of supply of 0.4 mmol/hr for the trisisobutylaluminium cocatalyst (the sole component comprising Al (molar mass of 27) used in the reaction) and the yield of reaction of 1.3 Kg/hr ($27 \times 0{,}4\ 10^{-3} / 1.3\ 10^{3} = 8{,}3\ 10^{-6}$). This corresponds to the amount of 8 ppm indicated in Table 1A in paragraph [0199] of the specification.

5. In view of the foregoing, the Board concludes that the subject-matter of Auxiliary Request 2 fulfils the requirements of sufficiency of disclosure.

Inventive step

6. The appellant observed in preliminary submissions that claim 1 would not be inventive over the whole range claimed, since no lower limit for the F content would be defined in said claim (statement of grounds of appeal, sections 60 to 72).

Firstly, as indicated in relation to sufficiency of disclosure, operative claim 1 is considered to implicitly define a lower value for the amount of F, i.e. corresponding to the limit of detection of the ion-chromatography which was usual at the date of filing of the patent in suit. Secondly and more importantly, this objection of lack of inventive step is as such not convincing, because it is not made having regard to the state of the art, as required by Article 56 EPC.

Inventive step starting from the disclosure of D11

7. The appellant objected that the subject-matter of claim 1 of Auxiliary Request 2 lacks an inventive step over the disclosure of D11 taken as the closest prior art. The passages of D11 referred to in the following are those of its translation D11'. In this respect, as pointed out by the appellant during the oral proceedings, the paragraph numbering in D11 refers to the paragraph preceding the numbering.

Suitability of D11 as the closest prior art

8. According to paragraph [0014] of the patent in suit, an object of the present invention was to provide an encapsulating material for solar cell having excellent insulating properties. D11, which aims to provide a solar cell sealing film for solar cell modules with

high power generation efficiency and high volume resistivity of the cured product (paragraph [0001]), is therefore concerned with the same objective. The disclosure within D11 selected by the appellant as the starting point for their assessment of inventive step was confirmed during the oral proceedings to be the encapsulating material for solar cell described with the example of the experimental part of D11.

This encapsulating material is described in paragraphs [0113] to [0119]. It comprises a commercial ethylene/propylene/5-ethyliden-2-norbornene copolymer (EPDM), a crosslinking agent, a silane coupling agent, a crosslinking aid and a mixture of light stabilizers. The obtained resin composition used as a solar cell sealing film contains 5 ppm of metal residue. The volume resistivity of the cured composition is indicated to be $6.61\ 10^{17}\ \Omega.cm$.

8.1 Referring to an interpretation in decision T 1833/14 of Opinion of the Enlarged Board G 1/92, the respondent submitted before issuance of the ~~recent~~ decision of the Enlarged Board G 1/23, that the example of D11 using a commercial polymer did not represent an enabling disclosure, as information on the physical properties of that polymer were missing and its synthesis was not described (rejoinder, page 16, sections 76 and 77). In view of decision G 1/23 this argument is not tenable, since the Enlarged Board rejected an interpretation of G 1/92 according to which a non-reproducible but otherwise existing and commercially available product would not belong to the state of the art (Reasons 55 to 67).

Although this was not submitted by the respondent in relation to the exemplified encapsulating material of

D11 comprising a commercial polymer, but only with regard to the encapsulating material used in Example 3 of D4 comprising a different commercial polymer (see point 14.2 below), the general consideration by the respondent that it would be unrealistic and necessarily contaminated by hindsight to assume that a skilled person would start from a non-reproducible polymer, i.e. spending considerable resources on establishing the synthesis conditions leading to that polymer is as a principle not accepted by the Board, specifically after decision G 1/23. It is referred in this respect to points 14.3 and 14.4 below.

On that basis the Board is satisfied that the exemplified encapsulating material described in paragraph [0113] to [0119] of D11 belongs to the state of the art and represents a suitable starting point for the skilled person aiming at providing an encapsulating material for solar cell having excellent insulating properties. It is therefore taken as the closest prior art for an assessment of inventive step of the subject-matter of operative claim 1 in accordance with the problem solution approach.

Distinguishing feature

9. It is undisputed that D11 does not disclose the use of a fluorine containing cocatalyst for the preparation of the commercial ethylene/α-olefin copolymer used in the example of that document, let alone a content of fluorine element for that copolymer. In view of this, the presence of a fluorine content in an amount equal to or less than 3.0 ppm is the sole feature distinguishing the encapsulating material of operative claim 1 from the encapsulating material constitutive of the closest prior art. As outlined in point 1 above,

the fluorine content originates from the catalytic system used to synthesize the ethylene/α-olefin copolymer.

Problem successfully solved

10. Regarding the then pending Main Request in which the content of fluorine element in the ethylene/α-olefin copolymer was defined to be equal to or less than 10.0 ppm, the opposition division acknowledged an improvement of the volume resistivity in view of the experimental results shown in Table 2A of the specification, without, however, formulating the technical problem successfully solved by the then claimed subject-matter (contested decision, page 22, 5th and 7th paragraphs). This was in agreement with the respondent's view that the objective technical problem could be formulated as the provision of an encapsulating material for a solar cell having an improved volume resistivity (rejoinder, sections 117 to 118).

10.1 The appellant submitted that the encapsulating material for solar cell of the example of D11 had a volume resistivity after curing of 6.61 10^{17} Ω.cm which was much higher than the volume resistivity obtained with the encapsulating materials according to operative claim 1 exemplified in the experimental part of the patent in suit. For this reason, the appellant submitted that the problem successfully solved over the closest prior art could only be defined as the provision of a further encapsulating material for solar cells.

This argument, however, is not convincing, because first of all the volume resistivity of the encapsulating material of the exemplified composition of D11 is measured at a lower temperature (23°C, D11, paragraph [0112]) than the one of the measurements in the patent in suit (100°C, paragraph [0052]). The value obtained for the composition of D11 would clearly be lower if measured at the higher temperature.

In addition, the additives and/or their amount, in particular the organic peroxide used for the crosslinking treatment, vary between the encapsulating materials compared by the appellant, which differences are expected to impact the volume resistivity of the cured encapsulating material.

10.2 In the oral proceedings before the Board, the appellant, however, acknowledged that the experimental results shown in Tables 2A and 2B demonstrated a causal link between a decreasing level of fluorine content originating from a cocatalyst forming ion pairs with the metallocene catalyst and an increase of the volume resistivity of the cross-linked encapsulating material for solar cell.

In this regard, it is first observed that a comparison between Example 1A and Comparative Example 1A concerning copolymers having the same content of Al (8 ppm) shows that a reduction of the F content from 32 ppm to 14 ppm results in increase of the volume resistivity from $9.1\ 10^{12}$ Ω.cm to $2.0\ 10^{13}$ Ω.cm, i.e. an increase of the volume resistivity by a factor 2.2 (Tables 1A and 2A).

An additional comparison between Example 3B and Example 2B demonstrates that for copolymers having the same content of Al (5 ppm) a reduction of the F content from 3.8 ppm to 2.5 ppm also results in increase of the volume resistivity, namely from 5.1 10^{13} Ω.cm to 4.5 10^{14} Ω.cm, i.e. a proportionally much higher increase of the volume resistivity by a factor 8.8 (Tables 1B and 2B).

Considering that the amount of the main catalyst is much lower than the amounts of cocatalysts, as shown by the corresponding rates of supplies in the examples concerned, the Board is satisfied that the comparisons addressed above allow to establish a causal link between the amount of F originating from the cocatalyst and the resulting volume resistivity of the encapsulating material obtained after crosslinking (see paragraph [0186] of the specification), i.e. higher amounts of F have a negative impact on the volume resistivity. This was indicated in the Board's communication and undisputed.

However, although by the same token the experimental data of the patent in suit demonstrate that the additional presence of residues of a cocatalyst forming ion pairs with the metallocene catalyst, such as one comprising fluorine, leads to a cured encapsulating material having a lower volume resistivity, those experiments also make it credible that a disproportionate and detrimental decrease of the volume resistivity can be avoided if the content of fluorine is not above the threshold of 3 ppm.

10.3 Accordingly, account be taken of the experimental evidence comprised in the patent in suit and that D11 is silent as to which catalyst system was used for obtaining the commercial ethylene/α-olefin copolymer employed in the example of D11, i.e. as to whether or not its synthesis involved a cocatalyst reacting with the metallocene catalyst so as to form an ion pair, the technical problem successfully solved by the subject-matter of operative claim 1 which involves the use of a fluorine containing cocatalyst for the preparation of the ethylene/α-olefin copolymer can only reside in the provision of a further encapsulating material whose volume resistivity has been optimized for use ina solar cell.

Obviousness of the solution

11. It remains to be decided whether, in view of the disclosure of D11, possibly in combination with other prior art documents or common general knowledge, the skilled person desiring to solve said problem would have arrived in an obvious manner at an encapsulating material for solar cell in accordance with operative claim 1.

The appellant submitted in this respect that the skilled person reading the disclosure in paragraphs [0060] to [0063] of D11 would have been motivated not only to use a cocatalyst, including a compound which reacts with a metallocene compound to form an ion pair as mentioned in paragraph [0063], but also to minimize the residual level of any metallocene and cocatalyst. This, according to D11, would maximize the volume resistivity of the encapsulating material, because ion migration would be suggested in D11 to be problematic and associated with poorer volume resistivity. Moreover, a compound that "forms an ion pair" when reacting with the metallocene catalyst would be a borate cocatalyst, i.e. one that contains the fluorine element, reference being made during the oral proceedings to the paragraph bridging columns 17 and 18 of D8. This would make it for the skilled person obvious to reduce the amount of borate cocatalyst containing fluorine element, whereby the maximum content of 3 ppm of fluorine defined in operative claim 1 would be arbitrary and therefore also obvious to the skilled person.

This was disputed by the respondent, essentially on the ground that the teaching of D11, in particular its paragraph [0063], only related to the reduction of the amount of residues of metal based catalysts and cocatalysts, but did not concern that of boron based cocatalysts.

11.1 The central issue in relation to obviousness of the solution is the meaning to be attributed to the first two sentences of paragraph [0063] of D11 reading "*In the case of using an organoaluminum oxy compound as a polymerization catalyst, a compound which reacts with a metallocene compound to form an ion pair, or an organoaluminum compound, it is also possible to reduce the amount of addition of these polymerization catalysts as much as possible. This is a preferred technique for reducing the metal residue in the ethylene polymer and in the solar cell sealing film.*"

In order to properly construe its meaning, this sentence has to be considered, not only in the context of the whole paragraph [0063] of D11, but also in view of that document as a whole.

11.1.1 According to paragraph [0009] of D11, the solar cell sealing film is required to have a high volume resistivity of the cured product in order to prevent the power generation efficiency from being reduced due to ion migration. The same paragraph teaches that the volume resistivity of the cured product of the solar cell sealing film depends on various factors, the volume resistivity being decreased when incorporating light stabilizers. In this regard, it can be agreed with the respondent that in order to obtain a high volume resistivity the focus of D11 is on the use of a specific hindered amine light stabilizer in conjunction with a water vapour permeability of the ethylene polymer within a predetermined numerical range (D11, paragraphs [0011] and [0025]).

11.1.2 D11 nevertheless teaches in many instances that another critical factor influencing the volume resistivity is the metal content of the ethylene polymer.

According to paragraph [0046] of D11, insulation properties of a solar cell sealing film containing the ethylene polymer as a main component tend to decrease when large amount of a polymerization catalyst containing a metal element is left in the ethylene polymer. In that case ion migration may occur (last sentence of paragraph [0046]).

It can be also taken from paragraph [0061] of D11 that metal residues reduce the volume resistivity of the cured product. While the respondent submits that D11 would indicate in paragraph [0061] that no impairment on volume resistivity is to be expected if the amount of metal residues is within the range of up to 50 ppm, which would still allow for even much larger quantities of fluorine, it is implicit from said paragraph that metal residues have a negative impact on the volume resistivity. The fact that levels of metal residues down to 0.1 ppm are taught, and that a reduction below this level is still possible, but not economically advantageous, suggests to the skilled person that volume resistivity is a function of the metal content. In other words, decreasing amounts of metal residues are taught in D11 to result in an increasing volume resistivity.

The content of metal residue in the solar cell sealing film is also taught in paragraph [0062] to depend on the activity of the polymerization catalyst (for example, a metallocene compound) used for the synthesis of the ethylene polymer, the concentration of catalyst in the obtained ethylene-based polymer being reduced when the catalyst has higher activity. D11 teaches therefore to increase the activity of the polymerization catalyst by polymerizing at the optimum polymerization temperature, increasing the polymerization pressure as high as possible and increasing the monomer concentration per polymerization catalyst. This is described to be the preferable technique for reducing the metal residue in the sealing film (paragraph [0062], last sentence)

11.1.3 The parties were in disagreement whether paragraph [0110] of D11 which concerns the determination of metal residues content in the polymer of the example describes a total amount for titanium, hafnium, and magnesium only, or whether that amount also includes aluminium and zirconium.

Paragraph [0110] of the translation D11' submitted with the notice of opposition reads as follows "*[Metal Residue] After wet decomposition of the solar cell sealing film, the volume was constantly adjusted with pure water, and aluminum, zirconium, and zirconium were mixed using an ICP emission spectrometer (trade name "ICPS-8100", manufactured by Shimadzu Corporation) Titanium, hafnium, and magnesium were quantified*".

The respondent submitted (rejoinder, page 17, section 80) that it would appear that the amount of metal residues refers only to titanium, hafnium and magnesium, and that aluminium, zirconium and zirconium (sic!) were mixed (presumably in order to provide a matrix for the determination by ICP). Thus, the "total metal content" evidently would only apply to the total content of titanium, hafnium and magnesium, but not aluminium.

This is not convincing.

Firstly, it is undisputed that the machine translation of that paragraph [0110] is defective, given the repetition of the term zirconium, the punctuation used and the absence of words between the terms "Shimadzu Corporation)" and "Titanium, hafnium, and magnesium were quantified".

Secondly, technically speaking, it does not make sense to mix aluminium and zirconium using an ICP emission spectrometer and this in order to quantify different elements, i.e. titanium, hafnium, and magnesium. The only sensible technical meaning is that the ICP emission spectrometer is used to quantify all these metals.

This is confirmed by the translation of this paragraph in Espacenet submitted by the appellant with letter of 27 August 2025 which reads "*Wet decomposition of the solar cell sealing film, followed by constant volume with pure water, using an ICP emission analyzer (trade name "ICPS-8100", manufactured by Shimadzu Corporation), aluminum, zirconium, Titanium, hafnium, and magnesium were quantified. The total amount of* *these metal elements was defined as "metal residue (weight ppm)"*."

It is also noted that D11 is a patent application of Mitsui Chemicals Inc, i.e. from the proprietor of the patent in suit, whereby the specification of the patent in suit describes the determination of the aluminium content in paragraph [0185], as follows: "After the ethylene/α-olefin copolymer was wet-decomposed, the volume was made to be constant using pure water, the amount of the aluminum element was determined using an ICP emission spectrometer (ICPS-8100 manufactured by Shimadzu Corporation), and the content of the aluminum element was obtained." This passage of the patent in suit confirms that the use of an ICP emission spectrometer such as used in D11 does not require a calibration step using different elements.

The above reading of the method described in paragraph [0110] of D11 is also supported by paragraphs [0310] and [0311] of D9' with a publication date of 29 March 2012, i.e. shortly after the priority date of the patent in suit, and which can be taken as a translation of D9, both being also patents of the respondent, D9 having a publication date of 9 October 2010. D9' describes that the residue content of the ethylene polymer (A) is determined by its decomposition by wet process and dilution with pure water to a given final volume, the amounts of aluminum, zirconium, titanium, hafnium and magnesium being quantified with an ICP emission spectrometer (ICPS-8100, Shimadzu Corporation). The total amount of the metal elements is defined as metal residue content.

Accordingly, contrary to the respondent's submissions (letter dated 19 September 2025, section 17), a verified human translation is not indispensable in order to establish the actual disclosure of paragraph [0110] of D11.

The Board is therefore satisfied that paragraph [0110] of D11 describes that the total amount of metal elements quantified in the experimental part of this document includes aluminum, zirconium, titanium, hafnium, and magnesium.

11.1.4 Returning to the first sentence of paragraph [0063], it is undisputedly common general knowledge that the "organoaluminum oxy compound as a polymerization catalyst, a compound which reacts with a metallocene compound to form an ion pair and an organoaluminum compound" are known cocatalysts, which can be added to the (metal based) main catalyst, allowing for the use of a lower amount of said main catalyst. In this respect it can also be referred to the appellant's argument that "the metal ions in D11 include Al, i.e. those coming from the cocatalyst" (statement of grounds of appeal, page 16, point 78).

Moreover, the experimental part of D11 describes that a measure of the metal includes aluminum (see point 11.1.3), which aluminum undisputedly originates from a cocatalyst, as understood by the skilled person.

Furthermore, considering the term "addition" and the use of the plural form "these", the first sentence of paragraph [0063] can only mean that in the case of using an organoaluminum oxy compound as a polymerization cocatalyst, a compound which reacts with a metallocene compound to form an ion pair, or an organoaluminum compound, it is also possible to reduce the amount of addition of these polymerization cocatalysts as much as possible, this being a preferred technique for reducing the metal residue in the ethylene polymer and in the solar cell sealing film.

In other words, when using those cocatalysts in a reduced amount, the amount of metal originating from both the main catalyst and the cocatalyst, is reduced.

This is in agreement with the consistent teaching in D11 to reduce the amount of metal residue as a mean to increase the volume resistivity, in addition to the selection of a specific hindered amine light stabilizer to be used in an ethylene polymer having a water vapour permeability within a predetermined numerical range.

Consequently, the cocatalyst compound which reacts with a metallocene compound to form an ion pair which is addressed in the first sentence of paragraph [0063], and whose amount can be reduced as much as possible for reducing the metal residue in the ethylene polymer, must be understood to be based on metal, as was stressed by the respondent during the oral proceedings.

11.2 It follows from the above analysis that D11 merely suggests as far as cocatalysts forming ion pairs with the metallocene main catalyst are concerned, those which are metal based, but not those which are based on non-metals such as boron. The fact that boron based cocatalysts are not considered by the skilled person as falling within the category of metal based cocatalysts, as illustrated e.g. in column 15, lines 37-43 of D8, was not disputed by the appellant. On that basis, D11 cannot suggest to the skilled person the use of a compound that "forms an ion pair" when reacting with the metallocene catalyst which is a borate cocatalyst, e.g. one that contains the fluorine element, as submitted by the appellant.

11.3 Moreover, even if the skilled person had considered the use of a different cocatalyst, e.g. a borate cocatalyst that contains the fluorine element, as submitted by the appellant by reference to the paragraph bridging columns 17 and 18 of D8, the skilled person would have found no suggestion in the prior art to use such a level of fluorine element of at most 3 ppm, which undisputedly corresponds to a much lower level of borate. In this regard, as agreed by the parties in the context of novelty of the subject-matter of the former main request in view of Example II of D3, a given content of fluorine in a borate cocatalyst corresponds to a much lower boron content (statement of grounds of appeal, points 50 and 51 and rejoinder, page 13, points 59 and 61).

11.4 Furthermore, there is no evidence that the person skilled in the art would have known or have found any suggestion about using a borate cocatalyst containing the fluorine element for the synthesis of an ethylene-based polymer to be used in an encapsulating material for a solar cell before the effective date of the patent. Most importantly, there is no indication that the skilled person would have been aware of the relevance of a borate cocatalyst containing the fluorine element for ionic migration in an encapsulating material and its insulating properties, especially when used in an amount up to the maximum level defined in claim 1 in terms of fluorine content corresponding to a much lower content of boron.

This means that in the hypothetical case of a replacement of the metal based cocatalyst compound forming ions pairs with the metallocene main catalyst by a boron based cocatalyst comprising the fluorine element the skilled person would not have found any suggestion in the prior art to lower the content of that alternative cocatalyst such as to not exceed the critical threshold of 3 ppm in terms of fluorine content.

While it might be considered *a posteriori* that the use of additives in general, in particular ionic species, will result in a decrease of the volume resistivity, there is no evidence on file that this would have been known to the skilled person in relation to residues of any cocatalyst, especially at the extremely low level defined in operative claim 1. Residues of catalysts are not additives, but already part of the produced polymer before addition of the latter, whose amount is generally much lower than that of additives. Accordingly, the common general knowledge concerning the detrimental effect of additives in general, in particular ionic species, invoked by the appellant at the oral proceedings, would not have led the skilled person to the claimed solution.

In the Board's opinion, a line must be drawn between what is suggested by the prior art without having in mind the teaching of the patent in suit and what appears logical in the light of the latter, e.g. in view of its experimental part, when put in perspective of the knowledge available from the prior art. While such apparent logical link is an element to be taken into account when assessing the technical problem solved over the closest prior art, as it relies upon the experimental evidence provided in the patent in suit and therefore its contribution to the art, care should be taken for an objective assessment of obviousness of the solution to disregard such logical link which would not have been known to the skilled person prior to the filing date of the patent in suit.

In the present case, based on the evidence on file, the relevance of ion migration in respect of borate cocatalysts was not suggested to the skilled person before the filing date in the prior art on file. Although it may appear logical that ion migration is not only an issue for metal based cocatalysts, but also boron based cocatalyst, the latter is only known from the experimental results shown in the patent in suit.

11.5 In view of the foregoing, the encapsulating material for solar cell defined in operative claim 1 has not been shown to be obvious to a person skilled in the art starting from the teaching of D11.

11.6 The appellant's objection that the subject-matter of operative claim 1 lacks an inventive step starting from from the disclosure of D11 is therefore rejected.

Inventive step starting from Example 3 of D4

12. The appellant objected in addition that the subject-matter of claim 1 of Auxiliary Request 2 lacks an inventive step over the disclosure of D4 taken as the closest prior art. While the objection was made in the written submissions referring to ENGAGE® 8400, it is undisputed that this objection is made in the light of the encapsulating material for solar cell modules comprising ENGAGE® 8400 which is described in Example 3 of D4. In what follows, that starting point will be for

the sake of simplicity also referred to ENGAGE® 8400 when convenient.

Admittance of the objection

13. The respondent submitted that this objection had not pursued at the oral proceedings before the opposition division and for this reason could not be admissibly reintroduced into the proceedings (rejoinder, sections 71 to 74).

This is in the Board's opinion not convincing.

13.1 It is undisputed that the contested decision does not address that objection, which had been raised in the notice of opposition (sections 73 to 75), albeit in relation to granted claim 1 defining a broader range of fluorine content with an upper limit of 30 ppm. This objection was submitted in addition to the objection that claim 1 was lacking novelty over the use of the commercial product ENGAGE® 8400 (notice of opposition, sections 43-54).

In the communication of the opposition division sent in preparation for the oral proceedings, the opposition division indicated that novelty over ENGAGE® 8400 was given, in particular as the evidence submitted did not define a general polymerization process to prepare the ENGAGE® polymers, but that granted clam 1 lacked novelty over D3 (sections 3.2 and 3.3 of that communication). The opposition division did not deal with the inventive step objection, but stated that "At the moment, the Opponent has not indicated which documents should in his view be regarded as being the closest prior art" (section 4).

The appellant reacted with letter of 21 April 2021 providing further submissions as to why granted claim 1 lacked novelty and inventive step over ENGAGE® 8400 (sections 34-44 and 55-59), explaining why there was no enablement issue for ENGAGE® 8400 and that it was also obvious to prepare and use a similar polymer falling within the ambit of granted clam 1 in solar cells.

In reaction to the opposition division's communication, the respondent replied for the first time with letter of 23 April 2021 to the notice of opposition and submitted the main request resubmitted with the rejoinder in appeal in which the sole amendment was the definition of an upper amount of 10 ppm for the fluorine content. Concerning novelty over D4, it was essentially argued in view of G 1/92 that ENGAGE® 8400 had not been made available to the public, since it could not be reproduced exactly, and this without undue burden (sections 61 to 71).

The appellant answered with letter of 17 June 2021 in which further submissions were made concerning lack of inventive step starting from ENGAGE® 8400 (section on inventive step on pages 4 and 5). It was submitted that all the skilled person needed to do was to copy D4 closely following the guidance in D8, which would result is the claimed subject matter.

The respondent filed further submissions with letter of 18 June 2021 which did not deal with the novelty or inventive step over D4.

13.2 During the oral proceedings, novelty, in particular over D4, was discussed (minutes, point 5.5.2). After a break, the chairperson announced the conclusion that the claims of the main request were novel over the cited prior art. As pointed out by the appellant, the chairperson started the discussion on inventive step explaining that the distinguishing feature over D4 chosen as the closest prior art was the content of fluorine, for which no pointer could be found in the prior art (minutes, point 5.6, first paragraph).

While the Reasons for the decision do not address inventive step over D4, it is also stated as a preliminary remark of Reasons 4 of the contested decision concerning inventive step that "*an extensive discussion about inventive step in the MR has been carried out during the O.P., also in view of the conclusions taken during the discussion about the above issues linked to Art. 123(2), 83 and 54 EPC*".

This preliminary remark, as far as the issues linked to Article 54 EPC are concerned, can only be understood as referring to novelty in view of the use of ENGAGE® 8400, since the sole starting points for assessing inventive step considered in the written submissions were D4 and D11, whereby novelty over D11 was never questioned.

In this respect, and as outlined by the appellant in their letter of 12 May 2023 (page 4, 4th paragraph dealing with inventive step), the crucial points in deciding novelty over D4 were that in the opposition division's view ENGAGE® 8400 was not enabling having regard to opinion G 1/92 and the fluorine content of that polymer was uncertain (contested decision, Reasons 3.3, 2nd to 8th paragraphs), which is in line with the respondent's written submissions before the opposition division.

Accordingly, the statement that "*D11 has been agreed to be the closest prior art*" in the decision (page 21, second paragraph) can not be understood to mean that the objection of lack of inventive step over D4 was no longer maintained, rather that the parties agreed that D11 represented a possible suitable starting point for assessing inventive step.

13.3 On that basis, the objection of lack of inventive step starting from D4 was admissibly raised and maintained in the proceedings leading to the decision under appeal. In view of the foregoing, the appellant's objection for lack of inventive step starting from D4 is not to be regarded as an amendment to the appellant's case within the meaning of Article 12(4) RPBA and is for this reason part of the appeal proceedings.

Suitability of the disclosure of Example 3 of D4 as the closest prior art

14. Having regard to the object of the present invention which was to provide an encapsulating material for solar cell having excellent insulating properties (point 8 above), it is in the Board's opinion justified for the skilled person to start from the disclosure of Example 3 of D4 which describes by reference to Example 1 of that document the preparation of an encapsulating material suitable for the manufacture of solar cell modules (pages 29 to 34). This was disputed by the respondent.

14.1 Before the issuance of decision G 1/23, the respondent had contested the choice of Example 3 of D4 as starting point for assessing inventive step, on the grounds that following the interpretation of Opinion G 1/92 in decisions T 23/11 and T 1833/14, the commercial product ENGAGE® 8400 used for the preparation of the encapsulating material in Example 3 of D4 was not enabled and for this reason should not be considered to have been made available to the public within the meaning of Article 54(2) EPC (rejoinder, sections 91 to 99).

In view of the the Enlarged Board's decision G 1/23, however, ENGAGE® 8400 and all its analysable properties and structure belong to the state of the art. This is because the product was physically accessible, irrespective of whether or not particular reasons could be identified for analysing its composition and structure, also if the skilled person would not have been in the position to reproduce it on their own (see G 1/23, Reasons 91). This concerned among others the chemical nature of the repeating units contained in ENGAGE® 8400 and its fluorine content, which undisputedly could be determined by the skilled person already at the date of D4.

Moreover, publicly available technical information concerning ENGAGE® 8400 can be found in document D4, D7 and D7b. According to those documents ENGAGE® 8400 is an ethylene 1-octene copolymer (D4, Example 3, page 30, line 14; D7, first paragraph; D7b, page 1, product grade chart in Figure 1).

14.2 Based on the Reasons for decision G 1/23, the respondent, however, submitted in its letter of 19 September 2025 (sections 30 to 48) that the Enlarged Board expressed serious concerns whether a product such as ENGAGE® 8400 could represent the closest prior art, despite the fact that this product and its analysable properties belonged to the state of the art within the meaning of Article 54(2) EPC.

This would follow from the Reasons 45-47 and 91-95 of G 1/23.

The Enlarged Board would have indicated in Reasons 46 that a distinction had to be made between those technical teachings that may be derived from the physical product itself, and the technical teaching that is required for manufacturing the product. Moreover, according to Reasons 47 of G 1/23 "*When applying the problem-solution approach, it may well be a plausible argument that the skilled person faced with the objective technical problem of manufacturing a product with similar properties cannot be assumed to depart from the product ENGAGE 8400 because its method of manufacture is not in the public domain. It can be argued that a skilled person would turn to some other starting point, purely as a question of identifying the theoretical "closest prior art"*".

The Enlarged Board would have also emphasized in Reasons 91 to 95 that the decision whether or not a nonreproducible product could represent the closest prior art depended on the circumstances of the case. In some cases, such a product could form the closest prior art, while in other cases it could only be considered as a secondary teaching (i.e. for combination with another starting point that represented the closest prior art).

The Enlarged Board would have given an example illustrating that, where a product could be taken as it is and could be supplemented by conventional means (such as by adding lemon juice to Coca-Cola), no inventive step might be present. In this example, Coca-Cola was taken as the closest prior art, and it (respectively the technical teaching it resembled) did not need to be modified. On the other hand, the other example given by the Enlarged Board would illustrate that, where a modification of the non-reproducible product as such was necessary, then inventive step might be given, and the non-reproducible product did not form the closest prior art. Based on the same example concerning Coca-Cola, Coca-Cola itself could not be considered to represent a suitable starting point for the inventive step assessment, when a skilled person would realize that its unknown recipe would have to be modified.

In the respondent's opinion, even after the clarification given in G 1/23, a composition comprising ENGAGE® 8400 could not be the closest prior art, because ENGAGE® 8400 and therefore the encapsulating material containing it could not be reproduced. It would be unrealistic and necessarily contaminated by hindsight to assume that a skilled person would start from a non-reproducible polymer, spending considerable resources on establishing the synthesis conditions leading to ENGAGE 8400, especially where the prior art also provides many related polymers for which synthesis and details are known.

14.3 This is not convincing, as the Board does not agree with the interpretation of G 1/23 made by the respondent for the following reasons.

14.3.1 Reasons 45 to 48 of G 1/23 are concerned with the reproducibility requirement establishing a legal fiction (see title of point 2.4.1.1). The analysis in these passages leads the Enlarged Board of Appeal to the conclusion that the fiction of the exclusion of a product from the state of the art in view of the reproducibility requirement should be treated with serious reservations (last sentence of Reasons 48). The scope of this section of G 1/23 is to show that the assumption that a commercially available product is legally non existing is artificial and manifestly contradicting notorious facts.

The Enlarged Board expressly rejected the position that a non-reproducible, but otherwise existing and commercially available product, does not belong to the state of the art, as this interpretation leads to an absurd result and therefore cannot hold (see Reasons 55 and 56).

In that part of the Reasons, ENGAGE® 8400 is taken as an example of a commercial product for the purpose of the reasoning (see passage in Reasons 47 cited by the respondent in point 14.2 above). This is accidental due to the fact that ENGAGE® 8400 is also the product considered in the referring decision (T 438/19 of 27 June 2023, see points 3.1 and 3.2). Although Reasons 45 to 48 take into account inventive step considerations, they are obviously not intended as an actual assessment of inventive step concerning the patent in the referring decision with respect to the selection of the product relevant as the closest prior art. Indeed this was not to be decided by the Enlarged Board. Even less they can be considered as referred to inventive step of claim 1 of the present case, in which the same product (ENGAGE® 8400) is of relevance.

14.3.2 In this respect, the second sentence of Reason 47 of G 1/23 concerns a plausible, i.e. a theoretical argument, illustrating the distinction to be made between those technical teachings that may be derived from the physical product itself, and the technical teaching that is required for manufacturing the product, addressed in Reasons 46.

The fact that in the second sentence of Reasons 47 an objective problem was formulated on a theoretical basis as manufacturing a product with similar properties (i.e. similar to ENGAGE® 8400 taken as a theoretical example for a commercial product) indicates that this product had been already selected in this theoretical case as the starting point for assessing inventive step considering thereafter possible consequences of its method of manufacture not being in the public domain. Therefore, contrary to the reading of the respondent, the present Board does not understand these passages as indicating that the Enlarged Board excluded that a commercial product could be taken as the closest prior art, if its method of manufacture is not in the public domain. This is further supported by the fact that the relevant sentences of that paragraph refer only to potential arguments in defence of inventive step.

14.3.3 To the contrary, not only the Enlarged Board maintained that readily available products cannot be excluded from the common general knowledge of the skilled person, hence also not from the state of the art within the meaning of Article 54(2) EPC (Reasons 67, last sentence), but it also expressly confirmed in Reasons 95 (second and third sentence) that the technical teaching relevant to the skilled person must always be determined in the light of the circumstances of each case and, thus, also a non-reproducible product may be considered to represent the closest prior art.

While the Enlarged Board gave in Reasons 96 two different examples of how a non-reproducible but publicly available product can be taken into account when inventive step is examined, the Enlarged Board specified at the end of that section that the relevant technical teaching that a skilled person would take from such a product is always case specific - it depends both on the product in question and on the invention under examination.

14.3.4 Contrary to the respondent's position in section (37) of its letter of 19 September 2025, it cannot be taken from the reasoning of the Enlarged Board that where a modification of a non-reproducible but commercially available product as such is necessary, then the non-reproducible product does not form the closest prior art. Such a reasoning would imply that the closest prior art, i.e. the starting point in the problem solution approach, is selected after having completed the assessment of obviousness of the solution (including the identification of the distinguishing features, the formulation of the objective technical problem and the analysis of the modification needed), which cannot have been meant by the Enlarged Board. Indeed, considerable efforts in reproducing a commercially available product cannot prevent its selection as the closest prior art, but could rather come into play after such a selection in the context of obviousness of the solution.

14.3.5 Moreover, the Board does not agree with the respondent's assumption that a non-reproducible, but commercially available, product or a product difficult to reproduce (in the present case a composition comprising an allegedly non-reproducible polymer) could not constitute a promising starting point. In the respondent's view a modification of the commercially available product, such as a polymer, would require a change of the synthesis conditions for said polymer, necessitating to establish its exact synthesis conditions before a modification even becomes possible. This would require an undue amount of experimental work.

The starting point for evaluating the existence of an inventive step for a product should be realistic or promising in the sense that the uses, effects and properties described for a product of the prior art would be relevant for the goals addressed in the patent under examination. The underlying idea of this approach is that the skilled person would consider that an object which is structurally sufficiently close to said product of the prior art, i.e. after an appropriate modification thereof, could be expected in view of the uses, effects and properties reported for said product to achieve the goals set out in the patent.

In that respect, when selecting a promising starting point for an invention, the skilled person will take into account for products put on the market relevant technical information on such products, such as technical brochures or any other relevant information publicly available. In this respect, the Enlarged Board ruled that technical information about a product put on the market, which information was made available to the public before the filing date, forms part of the state of the art within the meaning of Article 54(2) EPC irrespective of whether the skilled person could analyse and reproduce the product and its composition or internal structure before that date (G 1/23, Headnote II).

What needs to be modified, however, is part of the inventive thinking of the skilled person in order to solve the problem addressed, but not a consideration concerning the selection of that starting point. This is all the more the case when various possibilities for modification of that starting point exist.

In the analysis of inventive step, there is no reason for the skilled person to consider *a priori* (before having identified the differences and established the objective technical problem) that the solution would necessarily require a modification of the exact synthesis conditions used for preparing the commercial product. This applies in particular to the present case, as other solutions might for example consist in the replacement of that polymer by another commercially available polymer, the preparation of another polymer having similar properties without the need to find out the exact synthesis of the commercial product or modification concerning other aspects of the encapsulating composition, in particular the nature of other components.

14.4 In view of the above, the Board is satisfied that, also taking into account the considerations of the Enlarged Board in G 1/23, the encapsulating material of Example 3 of D4 which comprises the commercial product ENGAGE® 8400 represents a realistic starting point for the invention set out in operative claim 1, irrespective of whether the skilled person knows how to reproduce the commercial product.

Distinguishing feature

15. Having regard to the indication in D4, D7 and D7b that ENGAGE® 8400 is an ethylene 1-octene copolymer (see

last paragraph of point 13.1 above), it is uncontested that the sole feature which can distinguish the claimed encapsulating material from that described in Example 3 of D4 is a content of the fluorine element in the ethylene/α-olefin copolymer of equal or less than 3.0 ppm.

15.1 Concerning the presence of fluorine in ENGAGE® 8400, the appellant pointed out during the oral proceedings that it was indicated in the paragraph bridging pages 14 and 15 of D4 that the homogeneously branched, substantially linear ethylene/α-olefin polymers such as ENGAGE® polyethylene available from The Dow Chemical Company were fully described in US patents 5,272,236, 5,278,272 and 5,986,028. The latter was D8 in the present proceedings, which was a continuation or a continuation in part of the two first cited US patents, as indicated on page 1 of D8 under the section "Related U.S. Application Data", meaning that all these US patents comprised the same teaching.

The appellant contended that Example 24 of D8 in Table X concerned a material that was very similar to ENGAGE® 8400, whereby the material of Example 24 was described starting at column 33, lines 65 to be prepared using as a catalyst system a metallocene catalyst and a mixture of the cocatalysts MMAO (i.e. an aluminium based cocatalyst) and tris(pentafluorophenyl)borane.

Accordingly, if one accepts to the benefit of the appellant the argument that ENGAGE® 8400 has been prepared with the same catalyst system as in Example 24 of D8, one must conclude that ENGAGE® 8400 contains the fluorine element as part of residues of the borane cocatalyst, since D8 does not describe any purification step to remove traces thereof.

On that basis and as confirmed by experimental reports D10a and D10d (see point 15.2 below), it can be accepted that the product ENGAGE® 8400 as used in Example 3 of D4 must comprise fluorine as residue of the cocatalyst used for its synthesis.

15.2 Moreover, the appellant submitted that experimental report D10a would demonstrate that ENGAGE® 8400 would exhibit a fluorine content in the claimed range, namely 3.0 ppm. Although the measurement was carried out in D10a with a different product, namely ENGAGE® 8407, the appellant brought forward that the fluorine content of ENGAGE® 8407 would reflect that of ENGAGE® 8400, as ENGAGE® 8400 would differ from ENGAGE® 8407 solely by the absence of talc as dusting agent, reference being made to D7a/D7b. On that basis, there could not be an invention over D4 for lack of differentiating features. Starting from D4, it would have been obvious to use the formulation described in Table 1 of D4, including ENGAGE® 8400 having a F content within the range of operative claim 1, in a solar cell (letter of 27 August 2025, page 6, first and fourth full paragraphs).

This was disputed by the respondent arguing that the analysis reported in D10a and D10 had been conducted on an ENGAGE® 8407 material that was purchased in late 2013, as shown on page 22 of D10d (rejoinder, page 22, section 104). This meant that the F content of ENGAGE® 8407 reported in D10a and D10d and which was alleged by the appellant to represent that of ENGAGE® 8400 was not necessarily the F content of the ENGAGE® 8400 used more than 5 years earlier in Example 3 of D4.

In this respect, the respondent was of the view that a 5°C increase in melting point or reductions in flexural modulus (2% secant) and tensile strength by about 15% between 2011 (D7) and 2015 (D7b) demonstrated that ENGAGE® 8407 or ENGAGE® 8400 had not been produced with the same properties over the years, which may have involved a modification of the catalyst system (letter of 19 September 2025, page 5, sections 20 and 21).

While the appellant did not dispute that the measurement of the F content was made on a later ENGAGE® 8407 product, it took the view that these variations of properties might not necessarily have reflected changes in the actual grade of the ENGAGE® product, but changes in measurement techniques (letter of 27 August 2025, paragraph bridging pages 5 and 6). It was pointed out that the other properties shown in D7a, including the density, the melt index, the Mooney Viscosity, the Shore A and D values and the glass transition temperature were the same.

15.3 Having regard to the body of evidence submitted and the parties' arguments, the Board is not in the position to reach a firm conclusion as to whether or not ENGAGE® 8400 underwent substantial modifications between the relevant date of D4 (i.e. its filing date, as the ENGAGE® 8400 used in D4 was necessarily one which was available at that date) and the date at which ENGAGE® 8407, i.e. the equivalent of ENGAGE® 8400 in terms of the copolymer it is based on, was available for measurement in D10a and D10d.

However, even if one hypothesised that, in preparing a commercial product bearing the same designation over the years, a manufacturer will strive to maintain the same catalytic system in order to prepare a product with essentially constant properties in the interest of the consumers relying on properties advertised for this specific product, it must nevertheless be borne in mind that the amount of polymerization catalyst, including the cocatalyst, remaining as impurities in the polymer, reflects the activity of the polymerisation catalyst.

This activity depends among others on the process conditions, such as polymerization temperature, polymerization pressure and monomer concentration per polymerization catalyst (see above, point 3, penultimate paragraph and point 11.1.2, fourth paragraph). On that basis, even if the apparent variations in melting point or reductions in flexural modulus (2% secant) and tensile strength by about 15% between 2011 (D7) and 2015 (D7b) were due to different measuring conditions, as contended by the appellant, it would be speculative to conclude that the process conditions used between 2011 and 2015 necessary resulted in the same catalyst activity and therefore the same amount of catalytic residue in the polymer. This is all the more crucial in the present case, since the content of fluorine reported for ENGAGE® 8407 in D10a and D10d, meant to be that of ENGAGE® 8400 and measured more than 5 years after the relevant date of D4, exactly corresponds to the upper value set out in operative claim 1.

Considering in view of the above that small variations of the catalytic activity over a period of more than 5 years in the production of ENGAGE® 8400 cannot be excluded, the Board cannot conclude that the fluorine content of ENGAGE® 8400 used in Example 3 of D4 was within the limits defined in present claim 1.

On that basis, the subject-matter of operative claim 1 is considered to be distinguished from the encapsulating material of Example 3 of D4 by a lower content of the fluorine element.

Problem successfully solved

16. In view of the causal link between the amount of fluorine originating from the cocatalyst forming an ion pair with the metallocene catalyst and the volume resistivity of the encapsulating material obtained after crosslinking which has been established with the experimental data of the patent in suit and acknowledged by the appellant (see point 10.2 above), the problem successfully solved by the subject-matter of operative claim 1 over the encapsulating material of Example 3 of D4 is considered to have resided in the provision of an encapsulating material having higher volume resistivity after crosslinking.

Obviousness of the solution

17. Regarding obviousness of the solution, the appellant submitted the same arguments as those submitted in relation to D11 taken as the closest prior art, namely that the skilled person would have found in said document the suggestion to reduce the amount of borate cocatalyst containing fluorine element in order to increase the volume resistivity of the encapsulating material for solar cell (point 11 above).

This, however, is not convincing for the reasons given in points 11.1 to 11.4 above.

As explained in said points, D11 does not concern the use of borate based cocatalysts and no evidence was submitted suggesting that residues of boran based co-catalysts would be relevant, as far as ion migration or volume resistivity are concerned, let alone in respect of a low concentration thereof corresponding to a content of fluorine of at most 3 ppm, for which evidence has been provided in the patent in suit that it constitutes a critical threshold for an optimization of the volume resistivity of the crosslinked encapsulating material.

This, in the Board's opinion constitutes a contribution to the art justifying the acknowledgement of an inventive step for the subject-matter of operative claim 1 over the disclosure of D4.

17.1 Consequently, the appellant's objection that the subject-matter of operative claim 1 lacks an inventive step starting from D4 fails to convince.

18. In the absence of further objections of the appellant against Auxiliary Request 2, the patent is to be maintained in that form.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent on the basis of the claims of auxiliary request 2 filed with the reply to the statement of grounds of appeal after adaptation of the description, if necessary.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

D. Hampe D. Semino

Decision electronically authenticated