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**Datasheet for the decision  
of 8 April 2022**

**Case Number:** T 1114/19 - 3.3.03

**Application Number:** 09801812.0

**Publication Number:** 2352789

**IPC:** C08K3/34, C09D5/08, C09D7/12,  
C08K9/04

**Language of the proceedings:** EN

**Title of invention:**  
ANTI-CORROSIVE PAINTINGS AND COATINGS CONTAINING NANOPARTICLES

**Patent Proprietor:**  
Nanto Cleantech Inc.

**Opponent:**  
BYK-Chemie GmbH

**Relevant legal provisions:**  
EPC Art. 100(b), 56

**Keyword:**  
Grounds for opposition - insufficiency of disclosure (no)  
Inventive step - (yes)

**Decisions cited:**  
T 0083/01, T 0808/01, T 0815/07, T 1845/14



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Case Number: T 1114/19 - 3.3.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.03**  
**of 8 April 2022**

**Appellant:** BYK-Chemie GmbH  
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**Representative:** Altana IP Department  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 14 February  
2019 rejecting the opposition filed against  
European patent No. 2352789 pursuant to Article  
101(2) EPC.**

**Composition of the Board:**

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

## Summary of Facts and Submissions

I. The appeal lies against the decision rejecting the opposition against European patent No. 2 352 789.

II. Claim 1 thereof read as follows:

"1. Formulation for anticorrosion paints and coatings, based on epoxy, polyurethane, acrylic, alkydic, polyester resins and mixtures thereof, and comprising a multitude of mostly bi-dimensionally developed nanoparticles, with a few hundred and about one nanometer, respectively, as to lateral dimensions and thickness, wherein said nanoparticles consist of materials containing ions available for ion exchange reactions, previously treated by ion exchange reaction with ions of long chain molecules having at least 16 carbon atoms, the rotational viscosity of the formulation at 10rpm, measured according to ASTM D4212, being lower than 55000 mPa·s".

The additional claims were dependent claims 2 to 8 defining formulations falling within the definition of claim 1.

III. The following items of evidence were submitted *inter alia* during the opposition proceedings:

D2: Jui-Ming Yeh *et al.*, Siloxane-modified epoxy resin-clay nanocomposite coatings with advanced anticorrosive properties prepared by a solution dispersion approach, *Surface & Coatings Technology* 200, 2016, pages 2753-2763

D8: US 6,878,767 B2

D10: A. Goldschmidt *et al.*, Glasurit-Handbuch Lacke und Farben, 1984, pages 274-277 and 492-494

D12: ASTM D 4212-99 (Reapproved 2005) and

D13: ASTM D 2196-05.

IV. According to the reasons for the contested decision which are pertinent for the appeal proceedings:

(a) Sufficiency of disclosure was acknowledged, among others since the skilled person would find enough information at their disposal to determine the viscosity of the claimed formulations.

(b) Novelty over D2 and an inventive step over the disclosure of that document taken as the closest prior art was acknowledged.

V. The opponent (appellant) lodged an appeal against the above decision.

VI. A communication conveying the Board's provisional analysis of the case was sent in preparation of the oral proceedings which were held on 8 April 2022.

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

VIII. The respondent (patent proprietor) requested that the appeal be dismissed.

IX. The appellant's submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They were essentially as follows:

(a) The subject-matter of claim 1 lacked sufficiency of disclosure.

(b) The subject-matter of claim 1 lacked an inventive step starting from D2 as the closest prior art in the light of D8, D10 and D12. The same applied to claims 2 to 8.

X. The respondent's submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They are essentially as follows:

(a) The claimed formulations were sufficiently disclosed.

(b) The subject-matter of the granted claims was not obvious for the skilled person starting from D2 as the closest prior art.

## **Reasons for the Decision**

### *Article 100 (b) EPC*

1. The essence of the appellant's first and second objections of lack of sufficiency of disclosure is that the skilled person is not able on the basis of the disclosure of the patent in suit as a whole and using common general knowledge, to identify without undue burden the measurement methods to determine the rotational viscosity of the formulation at 10 rpm in accordance with ASTM D4212 and the size of the nanoparticles, respectively. The appellant concludes based on decisions T 815/07 of 15 July 2008,

T 83/01 of 10 August 2004 and T 808/01 of 11 May 2004 that the contested patent lacks sufficiency of disclosure as it does not provide enough information in respect of the determination of these parameters, whose claimed values are both essential features of the claimed invention.

- 1.1 With respect to measurement of the viscosity, the appellant's objection concerns in first place the clarity of the definition of the method defined in operative claim 1. It is argued that the test method ASTM D 4212 defined in claim 1, i.e. D12 in the present proceedings, does not concern a test method for rotational viscosity measurement. It is however uncontested that such a test method is mentioned in section 2 of D12, reference being made to ASTM Standard D 2196, i.e. document D13 of the present appeal proceedings. The appellant, however, submits that the skilled person even considering D13 would be missing details for the measurement, which details would impact the viscosity values determined. The Board found the appellant's arguments unconvincing.

Firstly, the appellant does not dispute that the skilled person would have at their disposal reliable known methods to measure a rotational viscosity at the rotational speed defined in present claim 1. Having regard to the indication that a rotational viscosity at a speed of 10 rpm has to be measured, the Board has no doubt that the skilled person would understand that the reference to ASTM D4212 (i.e. D12) in claim 1 of the patent in suit is not meant to designate a measurement by dip-type viscosity cups, which is the subject of D12, but rather ASTM Standard D 2196 (D13) which it is also referred to in section 2 of D12. This is because D13 concerns standard test methods for rheological

properties of non-Newtonian materials by rotational viscometer and because these methods are in addition well known to the skilled person in the field of paints (D13, points 4 and 20).

Secondly, concerning the details necessary to carry out a measurement in accordance with the methods of D13, the appellant does not dispute that the skilled person would be able to reliably measure a viscosity value at 10 rpm once the necessary apparatus and test conditions have been defined based on the content of D13 and common general knowledge. Even if the patent in suit does not provide all necessary details, which possibly might have an impact on the viscosity values measured, this lack of details concerning the measuring method would merely concern an alleged lack of clarity of claim 1. However, it does not concern the impossibility for the skilled person to prepare formulations in accordance with said definition, even if due to that alleged lack of clarity the subject-matter of claim 1 might be broader in scope than originally intended by the proprietor.

Moreover, having regard to the fact that the viscosity of the formulation can be easily adjusted, i.e. kept below a maximum value, by numerous well known means, such as the addition of diluent or solvent (paragraph [0043] of the patent in suit), the Board concludes that formulations meeting the viscosity defined in claim 1 can be obtained without undue effort.

1.2 As regards the size of the nanoparticles, claim 1 defines that they have lateral dimensions and thickness of a few hundred and about one nanometer, respectively. The patent in suit therefore does not call for a

precise determination of the dimensions of the nanoparticles.

Moreover, in the absence of any definition in claim 1 for a measuring method for determining the dimension of the nanoparticles, claim 1 must be considered to be open to any measurement method that the skilled person would consider to be conventional in the art.

The Board does not find any reason why the skilled person using conventional technics in the art such as Transmission Electron Microscopy or Dynamic Light Scattering would not be able to determine the dimensions of the nanoparticles to the degree of precision required by present claim 1.

- 1.3 According to the headnote of decision T 815/07 cited by the appellant *"The purpose of a parameter contained in a claim is to define an essential technical feature of the invention. Its significance is that the presence of this technical feature contributes to the solution of the technical problem underlying the invention. The method specified for determining the parameter should therefore be such as to produce consistent values, so that the skilled person will know when he carries out the invention whether what he produces will solve the problem or not."*

For the reasons provided in decision T 1845/14 of 8 November 2018 (see points 8.7 to 9.8 of the Reasons for the decision) the Board is not in the position to follow the rationale provided in T 815/07. In particular, in a case - like the present one - of a possibly unclear parameter defined in a claim, whose values required in the claim are indicated in the specification to be essential to solving the problem



underlying the patent at issue, the ability of the skilled person to solve that problem, when seeking to carry out the invention, is not a suitable criterion for assessing sufficiency of disclosure, when the problem is not part of the definition of the claimed subject-matter.

Decision T 808/01 is not pertinent, as it does not concern the issue of sufficiency of disclosure.

Decision T 83/01 concerns a specific case for which the skilled person would have no information on how to measure a parameter defined in the claim, contrary to the case at hand.

- 1.4 Accordingly, the appellant's objections that the subject-matter of claim 1 lacks sufficiency of disclosure due to a lack of information in the patent in suit concerning the methods for determining the rotational viscosity and the dimensions of the nanoparticles do not convince.
- 1.5 The appellant's third objection of lack of sufficiency of disclosure, raised with the statement of grounds appeal, is that the patent in suit does not contain any teaching as to how "*prepare particles from other materials than clay*", meaning that the skilled person could not carry out the claimed invention over the entire scope of the claim.

An objection concerning nanoparticles from other materials than clay was raised before the opposition division with letter of 4 September 2018 (page 4, last paragraph before the section dealing with novelty). The objection reads "*For the sake of completeness, it should be noted that claim 1 is not limited to*

*embodiments wherein the nanoparticles are clay particles. All arguments in support of sufficiency of disclosure provided by the Proprietor refer to embodiments wherein the nanoparticles are clays, and to montmorillonite specifically. Hence, there is no information at all provided in the contested patent for the claimed embodiments, wherein the nanoparticles are not based on clay. In view of the above, the contested decision does not provide enough information in respect of a numerical parameter which is an essential feature of the claimed invention. In accordance with established case law of the Boards of Appeal (T 815/07, T 83/01, T 808/01), this amounts to an insufficient disclosure in the meaning of Art. 100(b) and Art. 83 EPC".*

It is not explicit from that passage that this objection concerned the preparation of the nanoparticles. Having regard to the heading "*Particle size dimensions*" (middle of page 2) under which this objection is to be found and the reference to T 815/07 and T 83/01, it rather seems to have concerned the determination of the particle size dimension when the nanoparticles are not based on clay.

In any event, even if to the benefit of the appellant, it were considered that the appellant hinted in the letter of 4 September 2018 that the claimed invention lacked sufficiency of disclosure not only in relation to the ability to determine the size of the particles, but also because the patent in suit lacked a teaching for the preparation of nanoparticles from materials other than clay, there is no indication that this objection was further elaborated, let alone pursued in opposition proceedings, in particular during the oral proceedings before the opposition division. The minutes

are silent in this respect, which is consistent with the contested decision in which this issue is not mentioned. The appellant also did not ask for a correction of the minutes, let alone submitted that this objection had been raised during the oral proceedings.

If an objection under Article 100 (b) EPC concerning the preparation of nanoparticles from materials other than clay was to be considered by the opposition division, it was the duty of the opponent to go beyond what at most could be perceived to the benefit of the appellant as a mere suggestion in its the letter of 4 September 2018 that such an objection could arise and to address it in a comprehensive manner during the oral proceedings. Under these conditions, there was no justification for the opponent and now appellant to have waited for the appeal proceeding to return to this separate objection under Article 100 (b) EPC and to elaborate it for the first time at the appeal stage, preventing thereby the opposition division to decide on that separate issue. On that basis, the Board found it appropriate to exercise its discretion according to Article 12(4) RPBA 2007 (which applies in view of Article 25(2) RPBA 2020) by not admitting the appellant's third objection under Article 100(b) EPC into the proceedings.

1.6 It is therefore concluded that the patent as granted meets the requirements of sufficiency of disclosure.

*Inventive step*

*Closest prior art*

2. D2 concerns, as the patent in suit, anticorrosion paints and coatings containing nanoparticles. More particularly, D2 concerns polymer-clay nanocomposite materials having advanced anticorrosive properties that consist of a siloxane-modified epoxy resin and inorganic nanolayers of montmorillonite (MMT) clay (title and abstract). The inorganic nanolayers of MMT clay of D2 whose use in epoxy resins is reported in tables 1 to 3 of page 2757 are prepared by a cationic exchange reaction between sodium cations of the MMT clay and tetradecyltrimethylammonium ions (page 2755, section 2.2 and page 2757, section 3.1, second paragraph). Those inorganic nanolayers of MMT clay are also described as clay platelets (page 2757, right-hand column, first full paragraph; page 2759, left-hand column, line 3).

The nanolayers of clay dispersed into the siloxane-modified epoxy resin are indicated to effectively increase the length of the diffusion pathways for oxygen and water, as well as the gas/vapor barrier of the coating resulting in an enhanced anticorrosion effect for epoxy-clay compared to pure epoxy coatings (page 2758, right-hand column, last full paragraph and page 2754, left-hand column, lines 26-30 and whole section 3.3 on pages 2758-2760).

3. In agreement with the contested decision, the parties consider that the disclosure of D2 constitutes the closest prior art. Having regard to the above analysis of D2, the Board is satisfied that D2, indeed,

constitutes a suitable starting point for assessing inventive step.

*Distinguishing features*

4. The parties agree that the formulation for anticorrosion paints and coatings according to granted claim 1 differs from the formulations of the closest prior art in that:

(i) the nanoparticles have lateral dimensions with a few hundred nanometers, whereas D2 describes in a direct and unambiguous manner a length of a few hundred nanometers only for one lateral dimension of the clay platelets and

(ii) the rotational viscosity of the formulation at 10 rpm is lower than 55000 mPa·s. In that respect, the viscosity of the formulations of D2 is unknown.

These constitute the sole features distinguishing the claimed formulations from those described in D2.

Contrary to the respondent's position, the definition in granted claim 1 of long chain molecules having at least 16 carbon atoms does not mean even implicitly that the number of carbon atoms so defined characterize the chain length of the molecule, which in the respondent's opinion would exclude from operative claim 1 formulations whose MMT clays have been treated with tetradecyltrimethylammonium ions. Having regard to the unambiguous definition of present claim 1 that the molecules have at least 16 carbon atoms, there is no need to have recourse to the specification to interpret that wording in a different manner. Accordingly, the wording of claim 1 is

considered to encompass formulations whose MMT clays have been treated like in D2 with tetradecyltrimethylammonium ions.

*Problem successfully solved*

5. Having regard to the closest prior art, the respondent formulated the objective technical problem as the provision of a formulation for anticorrosive paints and coatings making use of platelet shaped nanoparticles which results in an improved corrosion protection upon application to a surface. As to whether this formulation of the problem can be accepted as successfully solved, it is useful to assess whether the distinguishing features mentioned in above point 4 have been shown to be causative for the alleged improved corrosion protection.

*Lateral dimensions of the platelet shaped nanoparticles*

- 5.1 As noted by the opposition division, the patent in suit does not contain a comparative example according to D2 and the properties addressed in tables 1 to 3 of the patent in suit are not directly comparable with those described in tables 1 and 2 of D2. Furthermore, the patent in suit does not contain experiments showing the effect of selecting the platelets having the dimensions selected in accordance with present claim 1.

*Rotational viscosity of the formulation*

- 5.2 In relation to US 6,878,767, i.e. D8 in the present proceedings, it is explained in paragraph [0006] of the patent in suit that an arrangement of platelets in a parallel direction to the substrate reduces available passage spaces to corrosive liquid or gas molecules and

increases the distance to be travelled in order to reach the coating layer and substrate interface, thus reducing the possibility of oxide formation on the interface.

According to paragraph [0007] of the specification, it was found with the help of Transmission Electron Microscopy and permeation measurements that the order and the alignment at nanometer level of the nanoclays in the anticorrosion coating are disturbed due to the excessive formulation viscosity, resulting in a lower barrier effect to the humidity and oxygen and consequently an increased corrosion, compared to a formulation providing an arrangement of platelets in a parallel direction to the substrate. This is held to be due to the fact that platelets having a large surface in respect to their thickness are easily immobilized by polymer molecules of paint polymeric resins.

Although the nanoparticles in the form of platelets are chemically treated with ions of long chain molecules having at least 16 carbon atoms in order to facilitate their orientation parallel to the substrate the paint is applied on, in order to achieve a better corrosion protection the viscosity of the formulation has to be kept under a level for which the platelets still move easily within the polymeric paint and align parallel to the metallic substrate when the formulation is applied (paragraph [0019] of the specification) and solidified.

5.3 The alleged improved corrosion protection upon application to a surface addressed by the respondent is therefore relative to a similar formulation providing the same amount of platelets onto the surface, with respect to which a better alignment of the platelets on the substrate is achieved in view of a lower viscosity.

5.4 The technical explanations provided in the specification concerning the influence of the viscosity of formulations comprising platelet shaped nanoparticles on the anticorrosive performance of the formulation, reiterated by the respondent during the appeal proceedings, are not disputed by the appellant. They are in the Board's opinion not only credible, having regard to their logic, but also corroborated by the experimental results contained in the specification.

Firstly, the results summarized in tables 1 and 2 of the patent in suit (paragraphs [0030] and [0033], respectively) show that an increase of the amount of treated nanoclays in the formulation leads to an increase of its viscosity. This is observed over the full range of the amount of treated nanoclays added (tables 1 and 2). Secondly, under the conditions used in examples 2 and 3 of the patent in suit, the corrosion resistance of the painted substrate depends in a non linear manner on the amount of nanoclays added. The corrosion resistance is the highest for a certain loading of treated nanoclays, while when exceeding that loading value the corrosion resistance remains above the level of the non loaded resin, but steadily decreases despite an increase of the amount of treated nanoclays, i.e. the anticorrosion additive.

These experiments therefore indirectly demonstrate that the formulation viscosity is a key factor for optimizing the anticorrosion properties of the formulation making credible that a proper alignment of the platelet shaped nanoparticles on the substrate is essential for that purpose.



5.5 Finally, considering the absence of any experimental comparison with the formulations of the closest prior art D2 and the absence in operative claim 1 of any definition for a certain degree of corrosion protection or any feature implying a minimum amount of treated nanoclays necessary to obtain a satisfying degree of corrosion protection, it is not possible, however, to conclude that the formulations defined in present claim 1 result in absolute terms in an improved corrosion protection, compared to the formulations described in D2.

5.6 Under these circumstances, the problem effectively solved over the closest prior art resides in the provision of a further formulation for anticorrosion paints and coatings containing nanoclays anticorrosion additives, which formulation facilitates an orientation of the nanoclays according to a direction parallel to the substrate the formulation is applied on. At the oral proceedings, this formulation of the problem effectively solved over the closest prior art, corresponding to that provided in the preliminary opinion of the Board in its communication sent in preparation for oral proceedings, was agreed upon by the appellant.

#### *Obviousness*

6. It remains to be decided whether the skilled person desiring to solve the problem identified above would, in view of the disclosure of D2, possibly in combination with other prior art documents or with common general knowledge, have modified the closest prior art in such a way as to arrive at the formulation of operative claim 1. In this respect the appellant referred to D8, D10 and D12.

- 6.1 It can be already taken from above point 4 that the closest prior art D2 does not indicate any viscosity value for the formulations described in that document. Furthermore, D2 does not address an orientation of the platelets according to a direction parallel to the substrate the formulation is applied on.
- 6.2 As regards D8, this document describes the possibility of obtaining after application and drying an orientation of the platelets parallel or nearly parallel to the substrate surface (column 3, lines 29-39; claim 10). The means described for achieving this parallel or nearly parallel orientation of the platelets is a chemical treatment of the platelets with polar compounds such as amino terminated silanes, epoxy terminated silanes, epoxy based compounds acrylics, and combinations thereof or non-polar compound such as an aliphatic acid (column 3, lines 29-30 and 40-44). It is explained that the treatment results in inter-molecular forces bringing the vast majority of the platelets into reasonably parallel relationship with the outer of the surface while the coating is still fluid, and particularly with brush application preferably immediately on contact of the formulation with the substrate (column 3, lines 29 to 39).

Accordingly, the skilled person looking at D8 would be prompted to adopt chemical treatment specifically preconised in that document, which however leads away from the claimed invention, since D8 does not describe a chemical treatment with ions of long chain molecules having at least 16 carbon atoms.

If to the benefit of the appellant it were considered by the skilled person in the light of D8 that

tetradecyltrimethylammonium ions used in the closest prior art D2 to treat the platelets are expected by the skilled person to also facilitate the orientation of the platelets parallel to the surface, D8 still would not have been shown to guide the skilled person towards the claimed solution, since D8 does not give any additional guidance concerning the measures to be adopted to ensure a proper alignment of the treated platelets, i.e. an appropriate viscosity of the paint as demonstrated by the experimental part of the patent in suit.

In this respect, D8 does not even describe the viscosity of the paint or coating formulations disclosed in said document. Contrary to the appellant's argument, the indication in column 3, lines 33-35 that the coating or paint formulation should be applied while the coating is still fluid and particularly with brush application, preferably immediately on contact of the formulation with the substrate, does not necessarily suggest the use of a rotational viscosity of the formulation at 10 rpm being lower than 55000 mPa·s. The appellant failed in this respect to show that a fluid paint or coating would necessarily equate with a rotational viscosity of the formulation measured at 10 rpm being lower than 55000 mPa·s.

D8 does not even disclose specific embodiments concerning the achievement of a parallel alignment of the platelets on the basis of which information concerning the viscosity of the formulation or coating employed could be gathered.

- 6.3 Concerning D10, the appellant submits that pages 274 to 277 of that handbook are concerned with viscosity of coatings and paints, the last paragraph of page 275

being in addition indicated to describe flow cups used in the coatings industry. It is also stressed by the appellant that page 276 describes some examples of typical flow cups and viscosity ranges associated with these cups (table 3). According to the appellant the viscosity of the various flow cups indicated in D10 would range from 8 to 460 mPa.s.

The appellant submits likewise that D12 is concerned with viscosities of paints, varnishes, lacquers, inks and related materials. The appellant submits that viscosity ranges for different types of flow cups mentioned in table 1 of that document correspond to viscosities far below the value of 55000 mPa.s defined as a maximum value in operative claim 1.

On that basis, the appellant argues that the skilled person relying on the common general knowledge represented by D10 or D12 would have been prompted to use formulations whose viscosity is within the range defined in claim 1 of the patent in suit.

The appellant's arguments based on D10 and D12 are for the following reasons not convincing. D10 consists of excerpts of a handbook about varnishes and paints (see cover), whose pages 492 to 495 concern anticorrosion paints, however without any indication of viscosity values. The other passages of that handbook submitted by the appellant with D10, i.e. pages 274 to 277, are not specified to concern anticorrosion paints. Having regard to the fact that the handbook out of which the excerpts submitted with D10 have been taken concerns varnishes and paints in general, there is no reason to consider that the viscosity values indicated on page 274 to 277 correspond to those encountered for

anticorrosion paints, in particular the specific ones of D2 containing nanoparticles.

Moreover, the mere fact that specific methods are known for example from pages 274 to 277 of D10 or D12 for measuring viscosity values within the range defined in granted claim 1 does not constitute evidence that all paints would be known to the skilled person to have viscosity values within that range, let alone for a specific application, in the present case anticorrosion paints as those of D2 containing nanoparticles.

- 6.4 Finally, the appellant's argument that a proper alignment requires mobility of the platelets which become more mobile with decreasing viscosity values and that the skilled person accordingly would not exceed a certain viscosity value for the formulation, is based on an inadmissible hindsight knowledge. While the need to control viscosity would appear obvious to the reader of the patent in suit, in the sense that it appears logical based on the information provided therein, for a proper assessment of the inventive step one should take care of separating the information known to the skilled person at the date of filing from the one which is the contribution of the inventor. In the present case, in the absence of evidence to the contrary it was the inventor's contribution to have brought to light the relationship between a specific maximum viscosity value of the formulation in a fluid state and the ability of platelet-shaped particles of that specific dimension to align parallel to the substrate surface.
7. On that basis, the formulations of claim 1 has not been shown to be obvious having regard to the state of the

art. The same holds true for dependent claims 2 to 8 which define preferred embodiments of claim 1.

8. In the absence of additional objections against the patent as granted, the respondent's sole request is therefore considered to be allowable.

## Order

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

The appeal is dismissed

The Registrar:

The Chairman:



C. Rodríguez Rodríguez

D. Semino

Decision electronically authenticated