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**Datasheet for the decision
of 25 September 2008**

Case Number: T 0369/06 - 3.4.02

Application Number: 99960357.4

Publication Number: 1151272

IPC: G01N 15/08

Language of the proceedings: EN

Title of invention:

Simultaneous determination of equilibrium and kinetic properties

Applicant:

CALIFORNIA INSTITUTE OF TECHNOLOGY

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 52(1), 56

Keyword:

-

Decisions cited:

-

Catchword:

-



Case Number: T 0369/06 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 25 September 2008

Appellant: CALIFORNIA INSTITUTE OF TECHNOLOGY
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 21 October 2005
refusing European application No. 99960357.4
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. Klein
Members: F. Maaswinkel
C. Rennie-Smith

Summary of Facts and Submissions

- I. The appellant lodged an appeal, received on 21 December 2005, against the decision of the examining division, dispatched on 21 October 2005, refusing the European patent application 99960357.4. The fee for the appeal was paid on 21 December 2005 and the statement setting out the grounds of appeal was received on 23 February 2006.
- II. The examining division objected that claims of the requests then on file were not allowable because these did not meet the requirements of Art. 82 EPC (main request) and because the subject-matter of claim 1 (main and auxiliary requests) did not involve an inventive step (Articles 52(1) and 56 EPC 1973) having regard to the disclosure in documents D2 and D1 and to the customary practice of a person skilled in the art.
- D1: US-A-5 571 401
- D2: Sensors and Actuators B, vol.43 (1997), pp. 180 - 185, E. Stussi et al. "Chemoresistive conducting polymer-based odour sensors: influence of thickness changes on their sensing properties".
- III. With the statement containing the grounds of appeal the appellant filed respective sets of claims of a main and a first and second auxiliary request and requested that these be considered by the Board and also filed an auxiliary request for oral proceedings.
- IV. In a Communication under Rule 100(2) EPC the Board made reference to the following publication cited in the patent application:

D6: Anal.Chem., vol. 68, no. 13, 1 July 1996, pp. 2191 - 2202, J. White et al: "Rapid Analyte Recognition in a Device Based on Optical Sensors and the Olfactory System".

In the preliminary opinion of the Board it would appear that this document anticipated the subject-matter of claim 1, because it disclosed a sensor array device comprising several optical polymer/dye coated fibers of the same composition but having different thicknesses.

- V. With a letter dated and received 25 June 2008 the appellant filed a new main and auxiliary request.
- VI. In a Communication pursuant to Article 15(1) RPBA accompanying a summons to oral proceedings the Board expressed doubts that the subject-matter of the claims on file involved an inventive step.
- VII. With a further letter dated 19 September 2008 and received on 22 September 2008 the appellant filed a new main and auxiliary request and announced that it would not be represented at the oral proceedings.
- VIII. Oral proceedings took place on 25 September 2008. In a telephone conversation with the rapporteur the representative of the appellant confirmed that the expressions "a first sensor" and "a second sensor" in claims 7 and 8 of the main request should read "the first sensor", respectively "the second sensor" (emphasis added) and requested that these claims be corrected accordingly.

IX. The wording of independent claim 1 according to the main request reads as follows:

"A sensor device comprising a sensor array for detecting an analyte in a fluid, and a detector capable of detecting an electrical response operatively associated with said sensor array;

characterised in that:

said sensor array comprises:

a first sensor having a first predetermined polymer thickness; and

a second sensor having a second predetermined polymer thickness;

wherein the polymer of the first and second sensors are the same;

said first predetermined polymer thickness is different than said second predetermined polymer thickness; and said first sensor has a first sensor thickness of 0.01 μm to 20 μm ".

The wording of independent claim 7 of this request reads as follows:

"The use of a device as claimed in any of claims 1 to 6 for measuring a diffusion coefficient of an analyte, said method comprising:

contacting the first sensor with said analyte to elicit a first electrical response;

contacting the second sensor with said analyte to elicit a second electrical response; and

comparing the first response to the second response to calculate a time lag and thereafter measuring the diffusion coefficient of said analyte".

The wording of independent claim 8 of this request reads as follows:

"The use of a device as claimed in any of claims 1 to 6 for simultaneously determining a partition coefficient and a diffusion coefficient of an analyte, said method comprising:

contacting the first sensor with said analyte to elicit a first electrical response;

contacting the second sensor with said analyte to elicit a second electrical response; and

comparing the first response to the second response thereby simultaneously determining said partition coefficient and said diffusion coefficient of an analyte".

Claims 2 to 6 and 9 of this request are dependent claims. The wording of the claims of the auxiliary request is not relevant for the purpose of this Decision.

X. The appellant's arguments may be summarised as follows:

The examining division had rejected claim 1 of the former main request under Articles 82 EPC and Articles 52(1) and 56 EPC, where the rejection under Art. 82 EPC followed from the objection under Art. 56 EPC, because in the opinion of the examining division it would be obvious to arrange a same polymer in different thicknesses in a sensor array.

However, in order to assess correctly a contribution to inventive step, it should be pointed out that the problem to be solved in the present patent application

relates to the provision of sensors that can be used for the simultaneous determination of equilibrium and kinetic properties of analytes, see page 1, lines 1 and 2; and page 3, lines 20 to 24 of the published patent application. According to the established case law, in applying the problem/solution approach the prior art must be considered in the light of the problem to be solved. Therefore the examining division incorrectly adopted the wrong problem when, starting from document D2, it stated that the problem was "how to shorten the measurement time" (see point 1.5 of the Grounds for the Decision). The examining division could only have decided to take an element from document D2 and apply it to document D1 with prior knowledge of the present patent application, since neither D1 nor D2 is actually concerned with solving the same problem: D2 is concerned with investigating the influences of thickness changes on the sensing properties of odour sensors (see Title). There are no considerations of arrays in D2 whatsoever. On the other hand document D1 is concerned with the provision of arrays for detecting analytes wherein the sensor has a plurality of non-conducting and conducting regions. Neither D1 nor D2 specifically contemplates the simultaneous detection of two separate parameters, namely the equilibrium and kinetic properties of an analyte. In particular D2 provides information which leads the skilled person away from the present invention, for instance, at page 181, col. 1, para 5, this document discloses "Since the polymer response in the steady state is used as the actual signal, we are not particularly interested in this study to the transient response...". Document D2 therefore explicitly leads the skilled person away from using the transient response as a

function of film thickness to determine simultaneously the kinetic and equilibrium properties of an analyte, since the authors of D2 do not use the time response at all in their analysis.

Document D1 does not describe devices containing different predetermined thicknesses of the same polymer. Column 10, lines 40 to 45 describe only that polymer films of different thicknesses have different conductivity. All that was described in column 10 is how to prepare different thicknesses of polymer. The conductivity was measured and described as information for the skilled worker but there was no suggestion that such different thicknesses of the same polymer could be employed in detection devices. The skilled worker would read D1 as a whole paying particular attention to the working examples. For instance, in column 2, lines 27 to 30 where it is stated: "Arrays of such sensors are constructed with at least two sensors having different chemically sensitive resistors providing dissimilar differences in resistance". Also column 3, lines 40 - 43 states that the sensor arrays according to the invention "...comprise a plurality of compositionally different chemical sensors". Document D1 teaches the skilled reader that the chemical composition of the sensor is varied, either qualitatively or quantitatively, by varying the chemical components themselves by varying the type of conductive or non-conductive material or by changing the amount of one material as compared to another, i.e., the ratio of components (as is made explicit in Table 3 where the footnote refers to the ratio in those particular examples being 2:3 (w/w) pyrrole to plasticizer). Reference is also made to the passage below this Table

in column 11, lines 37 to 40 which states: "Sensor arrays consisted of as many as 14 different elements, with each element synthesised to produce a distinct chemical composition, and thus a distinct sensor response, for its polymer film". Moreover emphasis can be found at column 14, lines 8 to 12 where it is pointed out: "Furthermore, producing thinner films will afford an opportunity to obtain decreased response times, and increasing the number of plasticizing polymers and polymer backbone motifs will likely result in increased diversity amongst sensors". This can leave the skilled worker in no doubt that faster sensors can be obtained by using thin films but that, in order to work, it is necessary that the sensors have different chemical compositions, for example different plasticizers and/or polymers. This is a clear teaching away from the present invention which depends on having the chemical composition of the sensor constant and varying the thickness of the sensor.

Finally with respect to document D6, this document discloses optical sensor arrays instead of sensor arrays providing an electrical response as in the present patent application. In D6 the sensor thickness is much thicker than that of the sensors defined in the present claim 1 and this document does not contain any information to suggest that thinner sensors should be employed. The dip method of production employed in D6 is seen to lead to thicker polymer coatings with a thickness of at least 50µm. Since D6 leads the skilled worker to employ much thicker sensors than in the present invention, it is contended that it cannot aid the skilled worker in reaching the present invention as defined in the independent claims of the main request,

i.e. the determination of both equilibrium or steady state parameters as well as kinetic or diffusion coefficient determination.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

Claim 1 of the main request finds its support in claims 1, 9 and 10 (electrical response), 3 (thickness of the first sensor) of the original claims and furthermore in the description on page 16, line 19, page 3, lines 11 and 12 and Examples 1 and 2 (polymers of the same material). This also applies to claims 7 and 8, which are supported by original claims 15 and 21, and the further claims. The board is therefore satisfied that the amendments in the claims find support in the respective claims as originally filed (Article 123(2) EPC).

3. *Patentability*

3.1 *Novelty - Claim 1*

In the decision under appeal there was no objection of lack of novelty.

3.2 *Inventive step*

3.2.1 *Closest prior art*

In the decision document D2 was identified as disclosing the closest prior art. According to the examining division, document D2 disclosed sensors made of the same polymer and different thicknesses, referring to Figure 1 and Chapters 2 and 3. According to the division, the subject-matter of claim 1 as then under consideration differed from the disclosure of D2 in that the sensors are arranged in an array.

3.2.2 In the determination of the closest prior art for assessing inventive step, normally a prior art document is selected which discloses subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications (Guidelines Part C, Chapter IV.11.7.1; and Case Law of the Boards of Appeal, Fifth Edition, Chapter I.D.3.1). Furthermore, in selecting the closest prior art, the first consideration is that it must be directed to the same purpose or effect as the invention (Case Law, I.D.3.2).

3.2.3 With respect to document D2, this document discloses a study of the change of resistance of a conducting polymer film sensor in the presence of odorants as a function of the polymer thickness of the films. As acknowledged by the examining division, document D2 does not disclose a sensor array but a one-element polymer sensor. However, having regard to the purpose or the effect of the invention as defined in the claims

(namely: to determine both equilibrium or steady-state parameters as well as kinetic or diffusion coefficient information), it appears that such an aim can only be obtained by a discrimination of at least two simultaneous measurement values (see page 3 of the patent application, "Summary of the Invention", line 10). Clearly, in order to carry out such a measurement the presence of an array (with at least two sensors) is indispensable. Therefore, since document D2 does not relate to a sensor array, it cannot properly be the closest prior art document for assessing inventive step following the problem /solution approach. It is added that the passage cited by the appellant ("Since the polymer response in the steady state is used... we are not particularly interested ...in the transient response") illustrates that the purpose pursued in D2 is totally opposite to the one of the present patent application, which inter alia relies on measuring the transient response of the respective sensors.

3.2.4 In the opinion of the Board, document D1 is more appropriate as the closest prior art document, because it relates to a sensor device comprising a sensor array (see Fig. 4A) for detecting an analyte in a fluid (see: Abstract, line 10) and a detector for detecting an electrical response (see Fig. 1B) operatively associated with the sensor array.

3.2.5 The subject-matter of claim 1 differs from the sensor array in the combined features of the characterising part the claim. Is it true that some of the features if considered individually and taken out of the context of document D1 may also be found in this document: for instance,

- Fig. 1A and Table 3 disclose that sensors 1 and 2 are of the same material (poly(pyrrole), no plasticizer), similarly sensors 3, 4 and 5 (poly(pyrrole) with poly(styrene) as plasticizer);
- in column 10, line 45 it is disclosed that a sensor film may range from 0.04 to 0.1 μm in thickness.

3.2.6 However, the Board could not find a teaching or a suggestion in this document that two sensors (even if these were to be composed of the same material and would have a thickness within the range defined in claim 1) should be selected to have two predetermined, different thicknesses. Furthermore, as pointed out by the appellant, the aim pursued in document D1 is to provide an electric nose by means of a variability in chemical sensitivity from sensor to sensor obtained by qualitatively or quantitatively varying the composition of the conductive and/or non-conductive regions (see Abstract). Also, even if Table 3 lists some sensor elements having the same composition, this disclosure should be read in the light of the subsequent passage (column 11, lines 35 to 40), where it is specified "Sensor arrays consisted of as many as 14 different elements, with each element synthesized to produce a distinct chemical composition, and thus a distinct sensor response" (emphasis added). In any case, concerning these sensors of the same material composition (nr. 1 and 2; and 3 to 5) in Table 3, document D1 is completely silent. In particular there is no teaching with respect to a thickness of these respective sensors.

3.2.7 In order to enable the simultaneous determination of kinetic and equilibrium properties of an analyte, the

selection of the different thicknesses of the first and the second sensor as defined in claim 1 (in combination with the further features) is required. Document D1 provides no teaching for either this technical problem, or for the measure defined in claim 1. Furthermore, since document D2 is not interested in transient response at all and does not relate to sensor arrays, it cannot be seen why the skilled person would have any reason to combine these disclosures.

3.2.8 During the appeal proceedings the board made reference to document D6. This document discloses optical fiber sensor arrays in which some of the fibers are coated with a same polymer/dye coating with different layer thicknesses (e.g. fibers #5 and #7 in Table 2, having layer thicknesses between 50 μ m and 100 μ m). The array in D6 therefore employs optical detection as opposed to the device of claim 1 which relies on electrical detection. Furthermore the sensor thicknesses of that optical array are substantially larger than those defined in claim 1.

3.2.9 In the opinion of the Board the skilled person, starting from the electrical array in document D1, would not have had an obvious reason to consult document D6, because the types of devices (electrical and optical) are fundamentally different: for instance the fluorescence response of a dye is usually very fast compared to electrical variations in resistance. This is also illustrated in the time-response in document D6, which is on a scale of a few seconds, compared to D1, Fig. 8, or the present patent application, Figures 1 and 2, where the responses are rather on a scale of minutes. Furthermore the layer thicknesses of the

optical polymer/dye coatings are much larger than those for electrical sensor layers. Finally, as in documents D1 and D2, document D6 also does not suggest that the different sensors from the same material composition but with different thicknesses could be used for simultaneous determination of kinetic and equilibrium properties of an analyte.

3.2.10 The remaining citations referred to in the examining proceedings are not more relevant.

3.2.11 Therefore, in the opinion of the Board, the subject-matter of claim 1 involves an inventive step (Art. 52(1) EPC and 56 EPC 1973).

3.3 Claim 7 defines the use of the device as defined in claim 1 for measuring a diffusion coefficient of an analyte; claim 8 defines the use of such a device for simultaneously determining a partition coefficient and a diffusion coefficient of an analyte. Since these coefficients are determined by using the particular sensor of claim 1, these claims are novel and inventive for the same reasons as claim 1. Clearly, because the claims share the same inventive concept, the former objection under Art. 82 EPC is obsolete.

3.4 The further claims 2 - 6 and 9 are dependent claims and are therefore equally allowable.

4. *Further prosecution*

4.1 The present independent claims now are restricted to sensor devices comprising a detector capable of detecting an electrical response. It is therefore to be

examined in which extent the description has to be adapted. Furthermore the Board notes the frequent occurrence of the expression "incorporated by reference" (see: Guidelines, Part C, Chapter II 4.18) and the statement relating to the "spirit of the invention" (Guidelines part C, Chapter III 4.3a). Since this adaptation of the description needs careful consideration, the Board finds it appropriate in the present case to remit the case to the first instance.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution on the basis of the main request filed on 22 September 2008 with the corrections in claims 7 and 8 shown in paragraph IX above and approved by the appellant by telephone on 25 September 2008.

The Registrar:

The Chairman:

M. Kiehl

A. G. Klein