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Datasheet for the decision of 3 May 2007

Case Number: T 1590/05 - 3.4.02

Application Number: 01974483.8

Publication Number: 1336089

IPC: G01N 21/03

Language of the proceedings: EN

Title of invention:
Detection system

Applicant:
Molecular Vision Limited

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1590/05 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 3 May 2007

Appellant: Molecular Vision Limited
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 4 May 2005 refusing European application No. 01974483.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: A. Klein
Members: F. Narganes-Quijano
B. Müller

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 01974483.8, filed as International application No. PCT/GB01/04521 and published as WO 02/42747.

II. During the first-instance examination procedure reference was made, among others, to the following documents:

D1: WO-A-0005166

D2: "Electroluminescence in conjugated polymers" R. H. Friend *et al.*, Nature Vol. 397, 1999, UK; pages 121 to 128 (XP-002189335)

D3: "Laminated fabrication of polymeric photovoltaic diodes" M. Granström *et al.*, Nature Vol. 395, 1998, UK; pages 257 to 260 (XP-002102235)

D4: "Polymeric photovoltaic cells: enhanced efficiencies via a network of internal donor-acceptor heterojunctions" G. Yu *et al.*, Science Vol. 270, 1995, US; pages 1769 to 1791 (XP-002102234).

In the decision under appeal the examining division held that the subject-matter of claim 1 of the requests then on file did not involve an inventive step (Articles 52(1) and 56 EPC). The examining division found in particular that document D1 represented the closest state of the art, that the claimed subject-matters differed from document D1 only in that the light emitting diode and the photocell each included an

organic semiconductor element, that the problem solved by these distinguishing features was the provision of a detection system of low cost, and that the teaching of document D2 relating to the low-cost manufacture of organic semiconductor elements rendered obvious the claimed subject-matter.

III. With the statement setting out the grounds of appeal the appellant submitted a set of claims 1 to 22 amended according to a main request and further sets of claims amended according to four auxiliary requests, and requested that the decision under appeal be set aside and that a patent be granted.

IV. In response to a telephone consultation with the rapporteur, the appellant filed with its letter dated 16.04.2007 amended claims 1 to 5 and amended pages 3 and 5 of the description replacing the corresponding application documents of the main request.

Claim 1 amended according to the appellant's main request reads as follows:

"A microfabricated detection system, comprising:

a substrate chip (2);

a flow channel (4) defined by the substrate chip to which a fluid sample is in use delivered; and

at least one detector (6a-6j) comprising at least one light-emitting diode (8a-8j) including an organic semiconductor element (12) for emitting light into the flow channel and at least one photocell (10a-10j) including an organic semiconductor element (12) for receiving light from the flow channel."

The main request includes dependent claims 2 to 22 all referring back to claim 1.

The wording of the claims amended according to the auxiliary requests is not relevant to the present decision.

V. The arguments of the appellant in support of its requests can be summarised as follows:

Document D1 discloses a detection system with a microtube extending from the substrate, and not with a flow channel defined by the substrate chip as claimed. In addition, the modification of the device of document D1 using the teaching of document D2 would not result in a low-cost detection system having the claimed combination of features.

The problem solved by the invention is not the provision of a detection system at low cost as held by the examining division, but the provision of an integrated detection system which is of high sensitivity and of low detection limits and has low cost (page 1, lines 6 to 7 and 12, page 2, lines 11 and 12, and page 3, lines 8 to 12 and 15 to 17 of the description of the application).

There is no teaching in document D2 that would lead the skilled person to understand that the introduction of organic semiconductor elements into the device of document D1 would result in a microfabricated detection system of high sensitivity and low detection limits. The emphasis of document D2 is in the use of organic polymers as the active semiconductor in light-emitting

diodes, and the document would not have prompted the skilled person to incorporate the organic semiconductor element into the photocell for the purposes of obtaining a detector of high sensitivity.

Thus, the examining division appears to have ignored the requirement for high sensitivity in the detection device. This device requires a certain level of sensitivity and the prior art does not teach that such a level of sensitivity could be achieved with a detector incorporating an organic semiconductor element. It was understood that such organic elements could be used in solar cells but that they were unable to provide the necessary high signal-to-noise ratio for very low light levels required for detection in micro-analysis applications (page 2, lines 8 to 12 of the application).

Reasons for the Decision

1. The appeal is admissible.

2. *Main request - Novelty and inventive step*

2.1 Document D1, considered by the examining division as representing the closest state of the art, discloses a micro-analysis detection system (Figure 9 together with page 34, line 1 to page 35, line 28) comprising a silicon-wafer substrate chip (page 34, line 5), a microtube (90) projecting from the chip and into which a fluid sample is in use delivered (page 34, lines 1 to 5 and 11 to 15 together with the description of Figures 4 to 7), and a detector comprising a light

source (92) constituted by an LED (page 35, lines 5 to 12) for emitting light towards the microtube and a photocell (94) for receiving light from the microtube (page 34, lines 5 to 9 and 17 to 19).

The subject-matter of claim 1 of the main request differs from the disclosure of document D1 not only in the provision of an organic semiconductor element in each of the light-emitting diode and the photocell as held by the examining division in its decision, but also in that the claimed detection arrangement comprises a flow channel defined by the substrate chip for receiving a fluid sample instead of a microtube partially inserted into, and extending from the substrate chip as it is the case in document D1 (page 34, lines 1 to 15 and Figures 4 to 7).

Thus, as already concluded by the examining division, claim 1 of the main request defines novel subject-matter over the disclosure of document D1 (Articles 52(1) and 54 EPC).

2.2 According to the disclosure of the invention (page 2, lines 8 to 12, page 3, lines 7 to 17, and page 6, lines 30 to 32), the claimed combination of features results in a low-cost microfabricated detection system having low detection limits and being capable of high-sensitivity measurements.

A comparison of the claimed microfabricated detection system with that disclosed in document D1 shows that the use of an LED and of a photocell both of the organic-semiconductor type and arranged as claimed with respect to the flow channel reduces the cost of the

system while maintaining a high-sensitivity measurement capability. Accordingly, the objective problem solved by the distinguishing features identified in point 2.1 above in combination with the remaining features of the claimed invention over the disclosure of document D1 is not merely the reduction of the cost of the detection system as held by the examining division in its decision, but rather the reduction of the cost of the detection system without detriment to the high-sensitivity measurement capability of the system as submitted by the appellant.

2.3 Document D2, considered by the examining division as providing a teaching that renders obvious the claimed invention over the disclosure of document D1, is a scientific review article on electroluminescence in conjugated polymers (title).

The document reports on the properties and the structure of organic semiconductor polymer films (pages 121 to 126), discloses the use of the organic semiconductor polymers as electroluminescent materials (page 121, first paragraph) and more particularly as active materials in light-emitting diodes (abstract and page 121, second and third paragraphs), and teaches the low-cost manufacture of the film-forming polymers (page 121, third paragraph, last sentence).

It follows that document D2 discloses the use of organic semiconductor polymers as active materials for the low-cost manufacture of LED's and that, as held by the examining division, this teaching would have prompted the skilled person confronted with the problem formulated in point 2.2 above to replace the LED of the

microfabricated detection system disclosed in document D1 by the semiconductor polymer-based LED taught in document D2 as a way of reducing the manufacture costs of the detection system of document D1 without detriment to the high-sensitivity measurement capability of the system.

However, contrary to the examining division's view, the Board cannot identify in document D2 any clear teaching or hint towards the corresponding replacement of the photocell of the detection system of document D1 by a semiconductor polymer-based photocell. As already stated above, document D2 discloses the use of the organic semiconductor polymers as electroluminescent active materials, and the disclosure of the document focuses on the use of the semiconductor polymers as light-emitting materials both in LED's (abstract and first paragraph) and in displays (page 127, last paragraph). The sole disclosure departing from the application of the semiconductor polymers as light-emitting materials can be found on page 121, third paragraph, lines 5 to 8 where reference is made to "a range of semiconductor devices [that] have been investigated; these include transistors[6-11], photodiodes[12,13] and LEDs". The examining division found that the sole specification of "photodiodes" in this passage constituted an unambiguous hint towards the replacement of the photocell of the detection system of document D1 by a semiconductor polymer-based photodiode. Nonetheless, semiconductor polymer-based photodiodes are mentioned in document D2 only as an example of devices that have been investigated and the document itself does not contain any disclosure on the results of the investigations. In addition, the sole reference

to "photodiodes" in document D2 is appended with a reference to citations [12] and [13] which were filed by the appellant during the first-instance proceedings as documents D4 and D3, respectively; however, the disclosure of each of documents D3 and D4 pertains to polymeric photovoltaic diodes for use in solar energy conversion (first and last paragraphs of document D3, and abstract and first paragraph of document D4), i.e. to photodiodes having a sensitivity suitable for achieving a relatively high efficiency in solar cells having an extended surface, and no disclosure can be found in these documents that would have allowed the conclusion that the polymeric photovoltaic diodes would inherently present the characteristics appropriate for their use in technical contexts characterized by low light levels and small detection areas and therefore requiring photocells with a higher sensitivity and efficiency.

Thus, even though document D2 would in principle provide a solution to the problem of reducing the cost of a photodiode by providing the photodiode in the form of a semiconductor polymer-based photodiode, in the absence in document D2 or in the references cited in that document of any disclosure relating to semiconductor polymer-based photodiodes having a sensitivity sufficient for their use as photodetectors in microfabricated detection devices of the type disclosed in document D1 and requiring, by the very nature of the device involving low light levels and small detection areas, a high detection sensitivity and efficiency, the Board cannot see in document D2 any clear disclosure or teaching that, at the filing date of the application, would have prompted the skilled

person to replace the photocell of the microfabricated detection system of document D1 by a semiconductor polymer-based photodiode of the type referred to in document D2 in order to solve the objective problem formulated in point 2.2 above.

2.4 The Board concludes that the subject-matter of claim 1 of the main request is not rendered obvious by the disclosure of documents D1 and D2 within the meaning of Article 56 EPC.

In addition, after consideration of the remaining documents in the file, the Board is of the opinion that the subject-matter of claim 1 as well as that of dependent claims 2 to 22 all referring back to claim 1 also involves an inventive step over this further prior art within the meaning of Article 56 EPC.

3. *Main request - Other requirements*

The Board is also satisfied that the application documents amended according to the appellant's main request and the invention to which they relate meet the remaining requirements of the EPC within the meaning of Article 97(1) EPC. In particular, claim 1 is based on claims 1 and 29 as published, dependent claims 2 to 9, 14, 15 and 21 are based on combinations of features of dependent claims 2 to 17, 22 to 25, 32 and 33 as published, and dependent claims 10 to 13, 16 to 20 and 21 correspond respectively to dependent claims 18 to 21, 26 to 28, 30, 31 and 34 as published (Article 123(2) EPC). As regards the description, the statements of the invention on pages 3 and 5 as published have been brought into conformity with the claimed invention

(Article 84 and Rule 27(1)(c) EPC), and the disclosure of document D1 has been appropriately acknowledged in the introductory part of the description (Rule 27(1)(b) EPC).

4. In view of the above considerations, the Board concludes that the decision under appeal is to be set aside and a patent be granted on the basis of the application documents amended according to the main request of the appellant (Articles 97(2) and 111(1) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent in the following version:
   - claims 1 to 5 filed with the letter dated 16.04.2007 and claims 6 to 22 of the main request filed with the letter dated 08.09.2005,
   - description pages 1, 2, 4 and 6 to 13 as published and pages 3 and 5 filed with the letter dated 16.04.2007, and
   - drawing sheet 1/1 as published.

The Registrar: The Chairman:

M. Kiehl A. G. Klein