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# Datasheet for the decision of 5 March 2015

**Case Number:** T 0323/13 - 3.3.09

**Application Number:** 00980863.5

**Publication Number:** 1252803

**IPC:** H01L51/30, H01L51/00, C09K11/06, H05B33/14

**Language of the proceedings:** EN

**Title of invention:**
COMPLEXES OF FORM L2MX AS PHOSPHORESCENT DOPANTS FOR ORGANIC LEDS

**Patent Proprietors:**
THE TRUSTEES OF PRINCETON UNIVERSITY
The University of Southern California

**Opponents:**
Merck Patent GmbH
Sumitomo Chemical Company Ltd.(former opponent)
BASF SE

**Headword:**

**Relevant legal provisions:**
EPC Art. 100(c), 100(b), 54(2), 56

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

**Decisions cited:**
T 0593/09, T 0544/12

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**
**Boards of Appeal**
**Chambres de recours**

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**Case Number: T 0323/13 - 3.3.09**

# D E C I S I O N
## of Technical Board of Appeal 3.3.09
## of 5 March 2015

| | |
|---|---|
| **Appellant I:**<br>(Opponent 1) | Merck Patent GmbH<br>Postfach<br>Frankfurter Strasse 250<br>D-64293 Darmstadt (DE) |
| **Appellant III:**<br>(Opponent 3) | BASF SE<br>Carl-Bosch-Strasse 38<br>67056 Ludwigshafen (DE) |
| **Representative:** | Hollah, Dorothee<br>Isenbruck Bösl Hörschler LLP<br>Eastsite One<br>Seckenheimer Landstrasse 4<br>68163 Mannheim (DE) |
| **Respondent:**<br>(Patent Proprietor 1) | THE TRUSTEES OF PRINCETON UNIVERSITY<br>P.O. Box 36<br>Princeton, NJ 08544 (US) |
| **Respondent:**<br>(Patent Proprietor 2) | The University of Southern California<br>3716 South Hope Street<br>Suite 313<br>Los Angeles, CA 90007-4344 (US) |
| **Representative:** | Maiwald, Walter<br>Maiwald Patentanwalts GmbH<br>Elisenhof<br>Elisenstrasse 3<br>80335 München (DE) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 21 December 2012 concerning maintenance of the European Patent No. 1252803 in amended form.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | W. Sieber |
| **Members:** | M. O. Müller |
| | K. Garnett |

## Summary of Facts and Submissions

I. This decision concerns the appeal by the opponents against the interlocutory decision of the opposition division that European patent No. 1 252 803 as amended meets the requirements of the EPC.

II. Opponents 1 to 3 (Merck Patent GmbH, Sumitomo Chemical Company Ltd and BASF SE) had requested revocation of the patent in its entirety on the grounds that the claimed subject-matter was not novel and not inventive (Article 100(a) EPC), that the patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC) and that the patent contained subject-matter which extended beyond the content of the application as filed (Article 100(c) EPC).

III. The documents submitted during the opposition proceedings included:

D1: Experimental report "Experimentelle Ergebnisse für verschiedene Metallkomplexe";

D2: M. A. Baldo et al, Applied Physics Letters, vol. 25(1), 1999, pages 4 to 6;

D3: P. I. Djurovich et al, abstract 292, Book of Abstracts, 217th ACS National Meeting, INOR 292, 21 to 25 March, 1999, 2 pages;

D4: M. A. Baldo et al, Pure Appl. Chem., vol. 71(11), 1999, pages 2095 to 2106;

D5: WO 02/02714 A2;

D6: Y. Ma et al, Synthetic metals, vol. 94, 1998, pages 245 to 248;

D7: R. Urban et al, Journal of Organometallic Chemistry, vol. 517, 1996, pages 191 to 200;

D8: F. O. Garces, PhD thesis, University of California, 1988, pages 5 and 285 to 290;

D14: US 5,840,897 A;

D15: G. Calogero et al, Inorg. Chem., vol. 34, 1995, pages 541 to 545;

D16: G. di Marco et al, Anal. Chem., vol. 70(23), 1998, pages 5019 to 5023;

D18: K. Dedeian et al, Inorg. Chem., vol. 30(8), 1991, pages 1685 to 1688;

D25: F. Neve et al, Inorg. Chem., vol. 38, 1999, pages 2250 to 2258;

D27: K. S. Suslich (ed.), ACS Symposium Series, 1996, 10 pages;

D29: D. F. O'Brien et al, Applied Physics Letters, vol. 74(3), January 1999, pages 442 to 444;

D30: M. A. Baldo et al, Nature, vol. 395, 1998, pages 161 to 164;

D31: G. di Marco et al, Adv. Mater., vol. 8(7), 1996, pages 576 to 580;

D32: M. C. Colombo et al, Inorg. Chem. vol. 33, 1994, pages 545 to 550; and

D35: Experimental report "Synthese eines Komplexes der Formel $L_2IrX$".

IV. In its decision, which was announced orally on 7 December 2012 and issued in writing on 21 December 2012, the opposition division considered that the subject-matter of the main request (claims as granted) extended beyond the application as filed.

V. Claim 1 of the first auxiliary request, which was found allowable by the opposition division, read as follows:

"1. An organic light emitting device comprising an anode, a cathode and an emissive layer, wherein the emissive layer is located between the anode and the cathode, and the emissive layer comprises a phosphorescent organometallic compound of formula $L_2MX$, wherein
L and X are inequivalent bidentate ligands,
M is a metal that forms octahedral complexes,
X is a monoanionic bidentate ligand;
and
the L ligands are monoanionic bidentate ligands each coordinated to M through an $sp^2$ hybridized carbon and a heteroatom."

Claims 2 to 10 were dependent on claim 1, and claim 11 referred to a device comprising at least one of the

organic light emitting devices according to any of the previous claims.

With regard to the first auxiliary request, the opposition division essentially reasoned as follows:

The first auxiliary request met the requirements of Rule 80 EPC and Article 123(3) EPC. As to Article 123(2) EPC, the feature that the organic light emitting device comprised an anode, a cathode and an emissive layer located therebetween was based on the application as filed. Firstly, the application as filed referred numerous times to OLEDs and defined these also as diodes which could be assumed to contain an anode and a cathode. Secondly, this feature did not provide any technical contribution but merely limited the scope of protection and thus, according to G1/93, did not extend beyond the content of the application as filed. The definition of ligand L in claim 1 was based on page 3, line 34 to page 4, line 7 and page 12, lines 11 to 17 as filed. As regards the multiple dependency of claims 5 to 10, the subject-matter of each of these claims was explicitly disclosed in the application as filed as a single independent embodiment such that each embodiment could be combined with any other unrelated independent embodiment without violating the requirements of Article 123(2) EPC.

The subject-matter of the main request was sufficiently disclosed. There was in particular no insufficiency as regards the term "phosphorescent". This term was a characterising feature of the claim such that any non-phosphorescent complex had to be considered to be outside the scope claimed. Furthermore the skilled person knew how to select a phosphorescent complex for the purpose of preparing OLEDs according to the

invention. Finally, an ambiguity introduced by way of this term into claim 1 was related to the issue of clarity under Article 84 EPC and therefore could not be discussed during the opposition proceedings.

The priority of the first auxiliary request was valid so that D5 was not prior art within the meaning of Article 54(3) EPC and hence not relevant to novelty.

The first auxiliary request was also inventive. The subject-matter of claim 1 differed from closest prior art documents D2 and D4 in that not all three ligands were the same. The problem to be solved was the provision of further organic light emitting devices. The claimed solution was not obvious in the light of D3 since it was not clear whether D3 disclosed a complex with a structure as required by claim 1 and since furthermore D3 did not mention any light emitting devices. In the same way as D3, D8 did not refer to any light emitting devices. Consequently neither D3 nor D8 would lead the skilled person to the organic light emitting devices as claimed.

VI. Appeals were filed by all opponents 1 to 3 (hereinafter appellants I to III).

The statement of grounds of appeal of appellant I (letter of 30 April 2013) contained:

D36: Chen et al., Organic Electronics, vol. 14, 2013, pages 8 to 18;

D37: Tsutui et al., Applied Physics Letters, vol. 85, 2004, pages 2382 to 2384; and

D38: Print out of webdictionary.co.uk, "Definition of monometallic".

The statement of grounds of appeal of appellant II (letter of 29 April 2013) contained:

D8b F. O. Garces, PhD thesis, University of California, 1988, pages 5 and 271 to 294;

D39: K. J. Brewer et al., Inorg. Chem., vol. 26, 1987, pages 3376 to 3379;

D40: A. W. Wallace et al., Inorg. Chimica Acta, vol. 166, 1989, pages 47 to 54;

D41: A. L Baba et al., Inorg. Chem., vol. 34, 1995, pages 1198 to 1207;

D42: L. Ortmans et al., Inorg. Chem., vol. 34, 1995, pages 3695 to 3704;

D43: Z. Liu et al., Inorg. Chem., vol. 51, 2012, pages 230 to 236;

D44: F. Baranof et al., Inorg. Chem., vol. 51, 2012, pages 799 to 811; and

D45: M. Xu et al., Inorg. Chimica Acta, vol. 361, 2008, pages 2407 to 2412.

The statement of grounds of appeal of appellant III (letter of 30 April 2013) contained:

D46: Print out of meriam-webster.com, "Definition of monometallic";

D47: Excerpt of textbook "Metallocenes", A. Togni and R. L. Halterman (ed.), vol. 1, 1998; and

D48: Screenshots of textbook "Transition-Metal Organometallic Chemistry", R. B. King, Academic Press.

VII. Together with its reply of 15 November 2013, the proprietor (hereinafter: "the respondent") filed first to twelfth auxiliary requests and:

D49: Letter of Dr. Fabienne Meyers, dated 2 October 2013;

D50: CIE colour space diagram indicating CIE coordinates of complexes mentioned in paragraph [0097] of the patent; and

D51: Structure of main and auxiliary requests.

VIII. By communication of 8 August 2014, the board communicated its preliminary opinion to the parties.

IX. With its letter dated 16 January 2015, appellant II withdrew its appeal and its opposition, and thereupon ceased to be a party to the proceedings.

X. Further arguments were made in the respondent's letter dated 5 February 2015.

XI. With its letter of 5 February 2015, appellant III requested that D49 and D50 as well as auxiliary requests 3, 6, 9 and 12 be not admitted into the proceedings and filed:

D52: WO 01/91203 A2.

XII. On 5 March 2015, oral proceedings were held before the board. Appellants I and III maintained their requests submitted during the written proceedings. The respondent replaced its main request (dismissal of the appeal) by a new claim set headed "New Main Request" (hereinafter "main request"). Claim 1 of this main request is identical to claim 1 of the first auxiliary request before the opposition division (see point V above).

XIII. So far as relevant to the present decision, the appellants' arguments can be summarised as follows:

- D49 and D50 should not be admitted into the proceedings since these documents were filed late, were not *prima facie* relevant and could have already been filed during the opposition proceedings.

- The ground under Article 100(c) EPC prejudiced the maintenance of the patent in the form of the main request:

  The feature in claim 1 "An organic light emitting device comprising an anode, a cathode and an emissive layer, wherein the emissive layer is located between the anode and the cathode,..." was not based on the application as filed. Furthermore, the definition in claim 1 of ligand L in complex $L_2MX$ to be a monoanionic bidentate ligand and the deletion of the feature of claim 1 as filed "wherein the emitting layer provides an emission which has a maximum at a particular wavelength" extended the subject-matter beyond the

content of the application as filed. Finally, various dependencies of claims 5 to 10 were not based on the application as filed (for the appellants' detailed arguments, see section 5 below).

- Claim 11 of the main request did not meet the requirements of Article 123(3) EPC. The word "display" had been deleted in the corresponding granted claims and this broadened the scope of protection conferred by the patent.

- The invention underlying the main request was insufficiently disclosed:

  - the skilled person had to find out by way of trial and error which OLED structures and which complexes $L_2MX$ gave phosphorescent emission;

  - the invention as defined in claim 1 was not sufficiently disclosed for platinum complexes. In order for platinum complexes to be octahedral as required by claim 1, platinum would have to be present as Pt(III) and furthermore would have to be coordinated with three bidentate ligands L. However, such complexes $PtL_3$ did not exist. Furthermore $PtL_3$ could not be sublimed. It was thus not possible to manufacture OLEDs containing $PtL_3$ complexes.

  - it was not defined in the patent to what extent and under what conditions the complex according to claim 1 had to emit phosphorescent light;

  - there was no guidance in the patent as to how complexes having a six-membered ring comprising

the metal, an $sp^2$ hybridised carbon atom and a heteroatom could be synthesized;

- coumarin as ligand L, as e.g. required by claim 7, could not act as a monoanionic bidentate ligand coordinating through an $sp^2$ hybridised carbon and a heteroatom; and

- the complex in figure 12 of the patent did not show phosphorescent emission (for the appellants' detailed arguments on this point, see section 7 below).

- The main request did not validly claim the priority of the opposed patent. Consequently, D5 was prior art and therefore prejudicial to the novelty of the main request.

- The main request lacked inventive step:

The $L_2MX$ complex of claim 1 differed from that of closest prior art document D2 in that only two rather than all three ligands of the metal were the same. The problem referred to by the respondent, namely the expansion of the range of emission colours of OLEDs, was not solved over the entire range of claim 1 (for the appellants' detailed arguments on this point, see section 9.5 below). The objective technical problem was thus the provision of further phosphorescent complexes. The solution as claimed was obvious over D2 alone since this document stated that new phosphorescent compounds deserved intensive investigation. Furthermore, the subject-matter of claim 1 was obvious in view of D2 in combination with any of D3, D7 or D8/D8b since these documents disclosed

the claimed alternatives. Finally, the subject-matter of claim 1 lacked an inventive step in view of D2 in combination with any of D6, D14, D15, D16, D18, D25, D27, D29, D30, D31 and D32.

Apart from D2, also D4 could be used as the closest prior art. This document was published before the priority date of the patent and referred to an oral disclosure having taken place before the priority date of the patent. In the same way as D2, D4 disclosed the complex $Irppy_3$, in view of which the subject-matter of claim 1 was not inventive.

XIV. So far as relevant to the present decision, the respondent's arguments can be summarised as follows:

- Documents D36 to D48 should not be admitted into the proceedings since they were filed late and were not *prima facie* relevant.

- The ground under Article 100(c) EPC did not prejudice the maintenance of the patent in the form of the main request:

  The feature in claim 1 "An organic light emitting device comprising an anode, a cathode and an emissive layer, wherein the emissive layer is located between the anode and the cathode,..." was based on *inter alia* claim 1 as filed. The presence of an anode and a cathode, which was not disclosed in claim 1 as filed, was an implicit feature of this claim. It belonged to the skilled person's common general knowledge at the priority date of the patent that every OLED contained an anode and a cathode. This was supported by the application

as filed, which used the terms "organic light emitting diode" (something which contains an anode and a cathode) and "organic light emitting device" synonymously. D36 and D37, referred to by the appellants, were in this respect not relevant since they were published long after the priority date and did not refer to OLEDs.

The definition of ligand L in claim 1 was based in particular on page 12, lines 11 to 15 of the application as filed.

Finally, the dependencies of claims 5 to 10 were based on the application as filed. The features of each of these claims were disclosed in general terms in the application as filed. The skilled person would thus have clearly and unambiguously derived from the application as filed that these features can be combined.

- Contrary to the appellants' assertion, claim 11 of the main request did not violate the requirements of Article 123(3) EPC since claim 1, which defined the scope of protection of the patent, had not been amended since the grant of the patent.

- The main request was sufficiently disclosed.

No undue burden was required to identify complexes falling under the structural definition of claim 1 that were phosphorescent. Firstly, the patent contained numerous examples of complexes which were phosphorescent. Secondly, apart from these specific complexes, the patent provided guidance on how to select ligands L and X within the structural definition of claim 1 in order to

obtain complexes that were phosphorescent. More specifically, the patent taught in paragraph [0090] to use ligands L that had a high fluorescent quantum efficiency. Furthermore, the skilled person was taught by paragraph [0099] to use ligands X that had higher triplet levels than the $L_2Ir$ framework, and finally the skilled person learned from paragraph [0100] not to use hexafluoro-acac and diphenyl-acac as ligand X. This teaching would enable the skilled person also to avoid the failures reported by the appellants. More specifically, nearly all complexes cited in appellant III's letter of 5 February 2015 contained the X ligand acac and a pyrazol structure in ligand L. Acac had a lower triplet level than the pyrazol group, which was to be avoided according to the teaching of the patent. Furthermore, the patent explicitly taught the skilled person not to use complexes with hexafluoro-acac ligands as tested in D35 and also taught how to transform the failure in D35 into success, namely by choosing ligands X with a higher triplet level. The situation was thus totally different from the case underlying T 544/12, relied upon by the appellants.

Octahedral complexes $PtL_3$ were referred to in paragraph [0070] of the patent, and there was no evidence provided by the appellants that this was wrong. The statement in this paragraph that compounds of the formula $PtL_3$ could not be sublimed without decomposition did not imply that OLEDs based on such platinum complexes could not be prepared. More particularly, it was also possible to incorporate the platinum complex as a solution into the host and apply this dopant-host

system in the form of a solution rather than by sublimation. Furthermore, the teaching given in the patent to identify ligands L and X that led to phosphorescent complexes was applicable irrespective of the type of metal present in the complex. Consequently, the skilled person was enabled by this teaching in the patent to prepare phosphorescent platinum complexes.

The appellants' argument that the skilled person had to find phosphorescent OLED structures by trial and error was not correct. Firstly, the patent taught the skilled person how to select appropriate OLED structures. Secondly, the basics of OLED structures formed part of the skilled person's common general knowledge at the priority date.

The appellants' argument that it was not defined in the patent to what extent and under what conditions the complex according to claim 1 had to emit phosphorescent light was not relevant since the argument only related to the clarity of the term "phosphorescent" rather than to sufficiency of disclosure.

Finally, the appellants' argument that the complex in figure 12 had no phosphorescent emission was not correct. More specifically, contrary to the appellants' assertion, the patent did not say that the lifetime of less than 1 µs reported for this complex automatically implied a non-phosphorescent emission.

- The main request was novel over D5 since the priority of the main request was valid and since thus D5 was not prior art.

- The main request was inventive:

  The organometallic compound of claim 1 differed from the closest prior art document D2 in that only two rather than all three ligands of the metal were the same.

  The objective technical problem solved in view of D2 was to expand the range of emission colours of OLEDs and to allow fine tuning of these colours. It followed from D50 that by replacing one of the three identical ligands in any of $Irppy_3$, $IrBQ_3$ and $Irthpy_3$ by acac, a shift in emission colour occurred. Furthermore, it could be seen in figure 37 of the opposed patent that the variation of X in $L_2IrX$ led to a shift of the emission spectra. The fact that according to paragraph [0097] of the opposed patent, emission stayed "very similar" and "no significant shift" occurred did not necessarily imply that there was no change in emission colour at all. Furthermore, the fact that the emission maximum for both complexes $Irppy_3$ and $Irppy_2acac$ was observed according to this paragraph at the same wavelength did not necessarily mean that the colours were identical. As regards D1, the two emission spectra in figure 1 were not identical and thus it could not be deduced from this figure that no colour shift occurred. Contrary to the appellants' assertion, the effect demonstrated in D50 was derivable from paragraph [0013] and section

"V.B.4 Color tuning" of the patent and thus could be considered for inventive step. Finally, the only meaningful construction of claim 1 was that the emission of the OLED resulted from the phosphorescence of $L_2MX$ rather than any other emitter not mentioned in the claim, as argued by the appellants. A shift in the phosphorescence of this complex thus would result in a shift of the emission of the OLED.

The claimed solution was not obvious in view of D2. D2 did not address the problem of expanding the range of emission colours of OLEDs and did not contain any motivation to replace one of the three identical ppy ligands of $Irppy_3$ by a different ligand. The skilled person could have modified the complex of D2 in various ways, e.g., by changing the metal present in the complex or by exchanging all three identical ligands by three different ligands. The claimed solution was based on the finding that meridional isomers of $L_3Ir$ complexes showed a marked red shift compared to its facial form. This had motivated the inventors of the patent to test $L_2MX$ complexes instead of $L_3M$ complexes since $L_2MX$ complexes existed only in the form of meridional isomers and thus were expected to lead to a colour shift compared to the $L_3M$ complex. The appellant's argument that the skilled person reading D2 would have modified one of the three ligands to obtain a colour shift was thus based on hindsight. The claimed solution was furthermore inventive in view of D2 in combination with any of D3, D7 or D8. None of these documents was directed to OLEDs or contained any motivation to modify the complex of D2 such as to arrive at

the claimed complex. The same applied for the further documents cited by the appellants.

The appellants' attack on the basis of D4 as the closest prior art was not relevant. D4 was not prior art since it was proven by D49 that D4 was published after the priority date of the opposed patent and since D4 was not identical to the oral disclosure referred to in this document.

XV. Appellants I and III requested that the decision under appeal be set aside and the patent be revoked.

Appellant III further requested that D49 and D50 as well as auxiliary requests 3, 6, 9 and 12 be not admitted into the proceedings.

XVI. The respondent requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request filed during the oral proceedings of 5 March 2015, alternatively on the basis of one of its auxiliary requests 1 to 12 filed with letter of 15 November 2013.

The respondent furthermore requested that D36 to D48 be not admitted into the proceedings.

## Reasons for the Decision

1. The appeal is admissible.

2. Admissibility of documents

2.1 Documents D8b and D36 to D52 were filed in the course of the present appeal proceedings.

2.2 D8b and D36 to D48 were submitted by the appellants at the earliest possible time during the appeal proceedings, namely with their respective statements of grounds of appeal. The documents do not create any fresh case but support the appellants' attacks based on the grounds of Article 100(c) EPC (D36 and D37) and lack of inventive step (D8b and D38 to D48). The board therefore decided to admit these documents into the proceedings.

2.3 D49 to D50 were filed by the respondent in response to the statements of grounds of appeal, i.e. equally at the earliest possible time during the appeal proceedings. D49 and D50 represent a continuation of the respondent's defence against the appellant's attacks on novelty (D49) and inventive step (D50) and therefore do not create any fresh case in the present appeal proceedings. D51 merely illustrates the structure of the respondent's claim requests and was not objected to by the appellants. Therefore, the board decided to admit D49 to D51 into the proceedings.

2.4 D52 was filed by appellant III with its letter of 5 February 2015. The respondent did not object to the admittance of this document and the board does not see any reasons for not admitting it. Accordingly, the board decided to also admit D52 into the proceedings.

Main request

3. Admittance into the proceedings

The main request differs from the first auxiliary request held allowable by the opposition division in that the back-reference in claim 7 to any one of the preceding claims 1 to 6 was amended to a back-reference

to claims 1 to 5 and in that the erroneous double denomination of "2-phenxylbenzoxazole" was removed. These amendments constitute a reaction to objections raised by the board during the oral proceedings and, in the absence of any objection from the appellants' side, the board admitted the main request into the proceedings.

4. Amendments - Article 123(2) EPC

The amendment of the back-reference in claim 7 merely excludes the back-reference to claim 6, which was erroneous since the compounds referred to in claim 7 all form five-membered rings while claim 6 requires the rings to consist of six atoms.

The deletion of "2-phenxylbenzoxazole" was necessary since this compound was cited twice in claim 7.

These amendments thus do not add any subject-matter to claim 7 and therefore meet the requirements of Article 123(2) EPC.

5. Amendments - Article 100(c) EPC

5.1 Claim 1 contains the feature "An organic light emitting device comprising an anode, a cathode and an emissive layer, wherein the emissive layer is located between the anode and the cathode,...". According to appellants I and III, this feature is not based on the application as filed.

5.1.1 The board does not concur with this view, but considers claim 1 as filed to provide a basis for this feature. This claim discloses "An organic light emitting device comprising an emitter layer ...". Hence, claim 1 as

filed provides a basis for OLEDs comprising an emitter layer. The board acknowledges that claim 1 as filed does not disclose the presence of an anode and a cathode in the OLED in an explicit manner. However, the board in this respect agrees with the respondent that it belonged to the skilled person's common general knowledge at the priority date of the patent that every OLED contained an anode and a cathode with the emissive layer being located therebetween. This is in fact supported by the application as filed. More specifically, the application as filed uses the terms "organic light emitting diode" and "organic light emitting device" synonymously and, as not disputed by the appellants, diodes contain by definition an anode and cathode. Reference is made in this respect to the title on page 1 ("ORGANIC LEDS", LED standing for light emitting diode), page 4, line 8 ("organic light emitting diodes") and page 1, line 15 as filed ("Organic light emitting devices").

5.1.2 Appellants I and III argued in this respect that D36 and D37 proved that OLEDs not having an anode or cathode existed, and that hence the disclosure of an OLED in claim 1 of the application as filed did not imply the presence of an anode and a cathode.

The board does not agree. Firstly, D36 and D37 are from 2013 and 2004, respectively, and thus cannot prove that at the priority date of the patent (1999) the skilled person would have considered OLEDs to not necessarily contain an anode and a cathode. Secondly, the devices disclosed in these documents are denoted electroluminescence devices ("FIPEL device" in D36 and "EL device" in D37) rather than OLEDs. In fact, D36 even contrasts the FIPEL device described in this document to a standard organic-light emitting diode

(OLED) (first and second paragraph of the introduction). So, these documents disclose EL devices without anode and cathode, rather than OLEDs without anode or cathode.

5.1.3 The appellants argued that OLEDs containing an anode, a cathode and only one emitter layer, which are covered by claim 1 of the main request, were not based on the application as filed. However, as set out above (point 5.1.1), in the same way as claim 1 of the main request, claim 1 as filed refers to OLEDs comprising an emitter layer, which covers the presence of only one emitter layer. The appellants' argument is therefore not accepted.

5.1.4 Former appellant II had argued in the written proceedings that the application as filed only disclosed organic layers separating the anode and cathode which, in its view was different from a layer between the anode and cathode as required by claim 1 of the main request. However, the board is not able to see any difference between layers separating or being between an anode and cathode, and in the absence of any further arguments from appellants I and III, does not find this argument convincing.

5.1.5 Therefore, the feature "An organic light emitting device comprising an anode, a cathode and an emissive layer, wherein the emissive layer is located between the anode and the cathode,..." is based on the application as filed.

5.2 Claim 1 requires the ligand L in complex $L_2MX$ to be a monoanionic bidentate ligand. According to appellants I and III, this definition of L is not based on the application as filed.

The board does not concur with this view either and considers page 12, lines 11 to 15 of the application as filed as an appropriate basis for the definition of L in claim 1. In this passage, the following is disclosed:

"The invention is further directed to organometallic complexes of metal species M with a bidentate monoanionic ligand in which M is coordinated with an $sp^2$ hybridized carbon and a heteroatom at the ligand. The complex may be of the form $L_3M$ (wherein each ligand L is the same), LL'L''M (wherein each ligand species L, L', L'' is distinct), or $L_2MX$ wherein X is a monoanionic bidentate ligand."

The first sentence of this passage requires the complex to have a bidentate monoanionic ligand in which M is coordinated with an $sp^2$ hybridized carbon and a heteroatom at the ligand. The next sentence gives examples of such complexes, the first one being complexes of the formula $L_3M$. The only ligand present in this complex is ligand L. Consequently, based on the definition in the first sentence, L must be a bidentate monoanionic ligand coordinated to M with an $sp^2$ hybridized carbon and a heteroatom. The same ligand L is present in the further example given in this sentence, namely in complex $L_2MX$. Hence also in this complex, which is the one of claim 1, L must be a bidentate monoanionic ligand coordinated to M with an $sp^2$ hybridized carbon and a heteroatom. This definition of L is identical to the definition of L in claim 1, which is thus based on the application as filed.

5.3 Claim 1 as filed contains the feature "wherein the emitting layer provides an emission which has a maximum

at a particular wavelength". This feature has been deleted in claim 1 of the main request. Appellant III argued during the written proceedings that by way of this deletion, claim 1 extended over the content of the application as filed.

However, since claim 1 requires the OLED to comprise an emissive layer, it is inherent to the organic light emitting device of claim 1 that it has an emission with a maximum at a certain wavelength. Therefore, the deletion referred to by appellant III does not violate the requirements of Article 100(c) EPC.

5.4 Each of claims 5 to 10 are dependent on more than one of the corresponding previous claims. According to appellants I and III, the combination of features created by several of these claim dependencies is not based on the application as filed.

The appellants in particular argued that claim 8, in so far as it is dependent on claim 7, was not based on the application as filed. Claim 8 defines ligand X by a list of five compounds and claim 7 defines ligand L by a list of nine compounds. These ligands are disclosed on page 17, lines 24 to 25 (ligands X) and page 17, lines 20 to 23 (ligands L) of the application as filed. From the ligands X disclosed in the application as filed, all the ligands have been chosen in claim 1, and from ligands L, nine of the eleven have been chosen.

The definitions for ligands X and L are disclosed in the above-mentioned passages of the application as filed in general terms. The skilled person reading the application as filed would therefore clearly and unambiguously derive therefrom that these definitions apply to all embodiments disclosed in the application

as filed, and that hence the disclosure of the ligands X also applies to and thus can be combined with that of the ligands L. The fact that only nine of the eleven ligands L disclosed in the application as filed have been chosen does not change this conclusion since such a selection does not represent a singling out of specific embodiments. Consequently, claim 8 as dependent on claim 7 is based on the application as filed.

The same applies to all other claim dependencies attacked by the appellants, i.e. the features of the attacked claims are disclosed in the application as filed in a general way, which features the skilled reader would combine with other embodiments of the invention. Nor does such a combination of features lead to the singling out of particular embodiments.

5.5 For the above reasons, the ground under Article 100(c) EPC does not prejudice the maintenance of the patent in the form of the main request.

6. Amendments - Article 123(3) EPC

6.1 Former appellant II argued in the written proceedings that claim 11 violated the requirements of Article 123(3) EPC. To arrive at claim 11 from claims 18 and 19 of the patent as granted the term "display device" has been amended to read "device". Hence the word "display" has been deleted and according to the appellant, this broadens the scope of protection conferred by the patent.

6.2 However, the broadest claim of the patent as granted is claim 1 and this refers to an organic light emitting device without any restriction to a display device or

any other type of device. Therefore, the fact that the device of claim 11 is no longer restricted to a display device does not extend the scope of protection conferred by the granted patent. Consequently, the requirements of Article 123(3) EPC are not violated.

7. Sufficiency

7.1 The complex referred to in claim 1 is defined in structural terms in that it contains one metal M, two ligands L and one ligand X (formula $L_2MX$) and in that (a) the two ligands L are monoanionic bidentate ligands each coordinated to the metal M through an $sp^2$ hybridized carbon and a heteroatom and (b) ligand X is a monoanionic bidentate ligand that is not equivalent to ligand L. At the same time, the complex is functionally defined as being phosphorescent.

Appellants I to III argued that not all complexes having a structure as required by claim 1 were phosphorescent. Therefore, the skilled person had to find phosphorescent complexes by trial an error. This amounted to an undue burden such that the invention defined in claim 1 was insufficiently disclosed.

7.1.1 As set out in T 544/12 (point 4.2), a definition of a group of compounds in a claim by both structural and functional features is generally acceptable under Article 83 EPC as long as the skilled person is able to identify, without undue burden, those compounds out of the host of compounds defined by the structural feature(s) in the claim which also fulfil the claimed functional requirement(s). Sufficiency of disclosure may for instance be acknowledged if all embodiments defined by the structural feature(s) of the claim also meet the claimed functional requirement(s). If this is

not the case, sufficiency may still be acknowledged if the common general knowledge at the priority date of the patent, or the patent itself, provides the skilled person with sufficient guidance on how to select those compounds out of the host of compounds defined by the structural feature(s) of the claim that also meet the claimed functional requirement(s).

7.1.2 In the present case, it has been shown by the appellants in D35 that $Irppy_2acac$, which falls under the structural definition of claim 1, has no phosphorescent emission at all. Furthermore, in its letter of 5 February 2015, appellant III cited eight iridium complexes falling under the structural definition of claim 1 that had either a very weak or no emission at all. These facts were not put into question by the respondent. There can thus be no doubt that not all complexes falling under the structural definition given in claim 1 are phosphorescent.

7.1.3 The crucial question therefore is whether the patent or the common general knowledge provides the skilled person with sufficient guidance to select those complexes falling under the structural definition of claim 1 that are phosphorescent.

7.1.4 This question has to be answered in the affirmative. Firstly, the patent contains numerous examples of complexes which are phosphorescent (page 11, line 4 to page 13, line 40 and figures 8, 10, 12, 14, 17, 19, 21, 22, 25, 26, 27, 29, 31 33, 35 and 36). Secondly, apart from these specific complexes, the patent provides guidance how to select ligands L and X within the structural definition of claim 1 in order to obtain complexes that are phosphorescent. Firstly, the patent teaches in paragraph [0090] to use ligands L that have

a high fluorescent quantum efficiency, since thereby it is possible to use the strong spin orbit coupling of the Ir metal to efficiently intersystem cross in and out of the triplet states of the ligands. Secondly the skilled person is taught by paragraph [0099] to use ligands X that have higher triplet levels than the $L_2Ir$ framework since otherwise the energy from the triplet levels of the L ligands is transferred to the triplet levels of the X ligands such that emission comes from the X rather than from the L ligands. Thirdly, the skilled person is taught by paragraph [0100] not to use hexafluoro-acac and diphenyl-acac as ligand X.

Consequently, unlike the case in T 544/12, the patent in the present case provides a number of specific examples and a general teaching how to obtain complexes falling under the structural definition of claim 1 that are phosphorescent. This teaching would also enable the skilled person to avoid the failures reported by the appellants. More specifically, nearly all complexes cited in appellant III's letter of 5 February 2015 contain the X ligand acac and a pyrazol structure in ligand L. Acac has a lower triplet level than the pyrazol group, which is to be avoided according to the teaching of the patent (paragraph [0099]). Furthermore, the patent (paragraph [0100]) explicitly teaches the skilled person not to use complexes with hexafluoro-acac ligands as tested in D35 and furthermore also teaches one how to transform the failure in D35 into success, namely by choosing ligands X with a higher triplet level.

Consequently, at the very least for iridium complexes, no undue burden is needed to select those that are phosphorescent.

7.1.5 Appellants I and III argued that the invention as defined in claim 1 was not sufficiently disclosed for platinum complexes. In order to arrive at octahedral complexes $L_2PtX$ as covered by claim 1, the platinum would have to be in the oxidation state III. No such complexes would exist.

However, the patent explicitly mentions in paragraph [0070] the octahedral complex $PtL_3$, which, according to the general synthesis method given in the patent, would be the starting material for $L_2PtX$ complexes. No proof was provided by the appellants that the reference in the patent to $PtL_3$ was wrong. In the light of this reference in paragraph [0070] of the patent to $PtL_3$, the appellants' objection amounts to a mere allegation which cannot succeed.

As regards this paragraph [0070] of the patent, the appellants argued that it was stated in this passage that complexes $PtL_3$ could not be sublimed. It was thus not possible in their view to manufacture OLEDs containing $PtL_3$ or $L_2PtX$ complexes. However, all that is stated in paragraph [0070] is that compounds of the formula $PTL_3$ cannot be sublimed without decomposition. This only implies that OLEDs on the basis of these platinum complexes cannot be prepared by sublimation of the complex. However, as set out by the respondent during the oral proceedings, and as not disputed by the appellants, it is also possible to incorporate platinum as a solution into the host and apply this dopant-host system in the form of a solution rather than by sublimation. Consequently, the statement in paragraph [0070] of the patent does not imply that it is not possible to manufacture OLEDs containing complexes of platinum.

Appellants I and III finally argued that the skilled person would not be able on the basis of the opposed patent to identify platinum complexes that were phosphorescent. However, as explained by the respondent during the oral proceedings and as not disputed by the appellants, the teaching given in the patent to identify ligands L and X that lead to phosphorescent complexes is applicable irrespective of the type of metal present in the complex. Consequently, the skilled person is enabled by this teaching in the patent to prepare phosphorescent platinum complexes.

Hence, also for complexes different from iridium complexes, and in particular for platinum complexes, no undue burden is required to identify those that are phosphorescent.

7.2 Appellants I and III argued that claim 1 did not specify the structure of the OLED. The skilled person had therefore to find out by way of trial and error which OLED structures gave phosphorescent emission.

The board does not agree with this argument. Firstly, the patent teaches the skilled person how to select appropriate OLED structures. More specifically, the general structure of OLEDs is described in paragraphs [0021] to [0031]. Suitable host materials are described in paragraphs [0082] to [0083]. The type of layers present in the OLED and specific examples thereof are disclosed in paragraphs [0084] to [0089]. Secondly, OLEDs were known for several years before the priority date of the opposed patent and hence the patent does not represent the first invention about an OLED. Basics of OLED structures thus formed part of the skilled person's common general knowledge at the

priority date. Consequently, taking the patent and its common general knowledge into account, the skilled person would have been able to select without undue burden appropriate OLED structures that led to phosphorescence.

7.3 Appellants I and III additionally argued that it was not sufficiently defined in the patent to what extent the complex according to claim 1 had to emit phosphorescent light in order to qualify as being phosphorescent.

This argument is not persuasive. It is true that claim 1 does not define the extent of phosphorescence. However this only means that it covers phosphorescent complexes irrespective of whether their emission is weak or strong, which is an issue of broadness rather than clarity. Furthermore, even if the extent of phosphorescence is unclear in claim 1, this as such would not lead to any insufficiency of disclosure (T 593/09, catchword and point 4.1.4)

7.4 According to the appellants, phosphorescence is dependent on numerous conditions such as temperature, environment and the concentration of the complex.

The appellants have not however provided any proof for this assertion. They have in particular not shown that the alleged lack of clarity is present to such an extent that the feature "phosphorescent" is deprived of any real meaning such that it does not function as a selection criterion for the identification of suitable complexes. Therefore, this argument of the appellants, if anything, is also only concerned with lack of clarity.

7.5 Appellant I additionally argued in the written proceedings that there was no guidance in the patent on how complexes having a six-membered ring comprising the metal, an $sp^2$ hybridised carbon atom and a heteroatom could be synthesized. There is however no evidence that it is not possible to synthesise these complexes or that the synthesis route that is described in the patent in general terms (reaction scheme in paragraph [0044]) is not applicable for ligands L forming a six-membered ring. In the absence of any such proof, the appellant's assertion cannot be accepted.

7.6 Former appellant II argued in the written proceedings that in so far as ligand L was coumarin, as e.g. required by claim 7, it could not act as a monoanionic bidentate ligand coordinating through an $sp^2$ hybridised carbon and a heteroatom. No further details or evidence were however provided. In view of this, also this objection is without substance.

7.7 Appellants I and III finally argued that the complex in figure 12 of the patent showed an emission with a lifetime of less than 1 µs, which according to paragraph [0072] of the patent implied that the emission was not a phosphorescent emission.

The board does not agree. In paragraph [0072], it is stated that in most cases the tested iridium complexes had emissions with lifetimes of 1 to 3 µs and that such a lifetime was indicative of phosphorescence. This statement does not however allow the reverse conclusion to be drawn that an emission with a lifetime of less than 1 µs automatically is a non-phosphorescent emission.

7.8 For the above reasons, the ground under Article 100(b) EPC does not prejudice the maintenance of the patent in the form of the main request.

8. Novelty

8.1 Novelty was only attacked in view of D5.

8.2 The priority dates of D5 are 30 June and 10 August 2000, which both are after the priority date of the opposed patent (1 December 1999). D5 thus is only prior art if the priority of the claims of the main request is not valid.

The priority document of the opposed patent is identical to the application as filed. For the same reasons as given above under Article 100(c) EPC, the subject-matter of the claims of the main request is therefore clearly and unambiguously derivable from the priority document. Consequently, the priority of the claims of the main request is valid. D5 thus does not form part of the prior art and thus cannot be used to attack novelty of the claimed subject-matter.

9. Inventive step

9.1 The invention underlying the opposed patent is directed to OLEDs with phosphorescent emitters (paragraphs [0008] to [0010]).

9.2 In the same way as the opposed patent, D2 refers to phosphorescent OLEDs (second paragraph of the left-hand column on page 4). Therefore, in line with the arguments of all parties, D2 can be considered to represent the closest prior art.

D2 describes the performance of an OLED containing, as a luminescent layer, the organometallic iridium compound $Irppy_3$ doped into a CBP (4,4'-N,N'-dicarbazole-biphenyl) host (abstract and penultimate paragraph of page 4). This layer is located between a cathode and an anode (first paragraph of the left-hand column on page 5). As acknowledged by all parties, the organometallic compound of claim 1 differs from that of D2 in that only two rather than all three ligands of the metal are the same, i.e. in that it has a formula $L_2MX$ rather than $L_3M$.

9.3 The respondent argued that the objective technical problem solved in view of D2 was to expand the range of emission colours of OLEDs and to allow fine tuning of these colours. This issue is addressed in the opposed patent in paragraph [0013] and section "V.B.4 Color Tuning".

9.4 As a solution to this problem, the patent proposes the organic light emitting device of claim 1, which is characterised in that it contains an emissive layer, which comprises the phosphorescent organometallic compound $L_2MX$ rather than the $L_3M$ complex of D2.

9.5 It has be be examined whether the above problem (point 9.3) has been credibly solved.

9.5.1 D50 shows the emission colour of (i) $Irppy_3$ and $Ir(ppy)_2acac$, (ii) $IrBQ_3$ and $IrBQ_2acac$ and (iii) $Irthpy_3$ and $Irthpy_2acac$. It follows from D50 that by replacing one of the three identical ligands in any of $Irppy_3$, $IrBQ_3$ and $Irthpy_3$ by acac, a shift in emission colour occurs. Furthermore, it can be seen in figure 37 of the opposed patent that the variation of X in $L_2IrX$ (X =

pico, acac and sd) leads to a shift of the emission spectra.

9.5.2 Appellants I and III argued that a colour shift was not obtained for all complexes covered by claim 1. Firstly, the patent states in paragraph [0097] that the emission spectra of some $IrL_3$ and $L_2IrX$ complexes were "very similar" and that in some cases there was "no significant shift in emission" between $IrBQ_3$ and $Irthpy_3$ on the one hand and their respective $IrL_2acac$ derivatives on the other hand. Secondly, according to paragraph [0097], $Irppy_3$ and $Irppy_2acac$ both gave a strong green emission with the same $\lambda_{max}$ of 510nm.

However, the fact that emission stays "very similar" and "no significant shift" occurs does not necessarily imply that there is no change in emission colour at all. Furthermore, the fact that the emission maximum for both complexes $Irppy_3$ and $Irppy_2acac$ is observed at the same wavelength does not necessarily mean that the colours are identical. More specifically, what matters for the emission colour is not only the wavelength of the maximum $\lambda_{max}$ but also the shape of the emission curve, and the latter is not disclosed in paragraph [0097].

In fact, it is deducible from D50 that there is a change in colour if, in any of $Irppy_3$, $IrBQ_3$ and $Irthpy_3$, one ligand is exchanged by an acac ligand. So, the appellants' interpretation of paragraph [0097] of the patent contradicts the experimental findings in D50.

9.5.3 Appellants I and III furthermore argued that D1 proved that the replacement of one of the 1-phenylisochinoline

ligands in Ir(1-phenylisochinoline)$_3$ by acac did not change the emission colour (bottom of page 2 and figure 1). However, the board concurs with the respondent's view expressed during the oral proceedings that the two emission spectra in figure 1 of D1 are not identical. It thus cannot be deduced from this figure that no colour shift occurs.

9.5.4 Appellants I and III argued that the results in D50 did not support inventive step since the effect demonstrated in D50, namely a colour shift in terms of CIE coordinates, was not derivable from the patent. This is however not correct. More specifically, the question whether the substitution by different ligands affects emission colour is discussed in detail in paragraph [0013] and section "V.B.4 Color Tuning" of the patent and CIE coordinates are a commonly used means to characterise emission colour.

9.5.5 Appellants I and III argued that no experimental details such as the type of host or the measurement temperature were given in D50 and that the types of complexes (meridional or facial) were not given. Possibly at other temperatures, hosts or types of complexes, no colour shift would have occurred.

These arguments are however pure speculation which, without any substantiation, cannot be accepted.

9.5.6 Appellants I and III finally argued that it could not be excluded that the complex $L_2MX$ transferred its energy to another emitter in the host, and that therefore the phosphorescence observed in the OLED as claimed could also come from this other emitter. Therefore any colour shift in the phosphorescence of the complex $L_2MX$ did not

necessarily result in a colour shift of the phosphorescence emitted by the OLED.

However, claim 1 requires the emissive layer to comprise the phosphorescent complex. The only meaningful construction of the claim is therefore that the emission of the OLED results from the phosphorescence of this complex rather than any other emitter not mentioned in the claim. A shift in the phosphorescence of this complex thus will result in a shift of the emission of the claimed OLED.

9.5.7 Consequently, the problem of expanding the range of emission colours of OLEDs and of fine tuning these colours has been credibly solved over D2. This problem thus represents the objective technical problem.

9.6 It remains to be examined whether the claimed solution is obvious.

9.6.1 D2 does not address the problem of expanding the range of emission colours of OLEDs. Furthermore, D2 does not contain any motivation to replace one of the three identical ppy ligands of $Irppy_3$ by a different ligand, let alone suggest that thereby the range of emission colours of OLEDs could be expanded.

Appellants I and III argued in this respect that the claimed solution was obvious over D2 since this document stated in the last paragraph of the left-hand column on page 6 that new phosphorescent compounds deserved intensive investigation. The skilled person would therefore have looked for complexes different from $Irppy_3$. He would furthermore have known that exchanging one of the three identical ligands in the $Irppy_3$ complex of D2 would have resulted in a colour

shift. Therefore, the skilled person not only could but also would have arrived at the claimed solution.

The board does not concur with this view. Firstly, even if the skilled person would have envisaged modifying the $Irppy_3$ complex of D2, he could have done so in various ways, e.g., by changing the metal present in the complex or by exchanging all three identical ligands by three different ligands. Secondly, as explained by the respondent during the oral proceedings, the claimed solution is based on the finding that meridional isomers of $L_3Ir$ complexes show a marked red shift compared to their facial forms. This had motivated the inventors of the patent to test $L_2MX$ complexes instead of $L_3M$ complexes since $L_2MX$ complexes exist only in the form of meridional isomers and thus were expected to lead to a colour shift compared to the $L_3M$ complex present as meridional and facial isomer (paragraph [0077] of the patent). The appellant's argument that the skilled person reading D2 would have modified one of the three ligands to obtain a colour shift is therefore based on hindsight.

Consequently, the claimed solution is not obvious in view of D2 alone.

9.6.2 Appellants I and III furthermore argued that the subject-matter of claim 1 was obvious in view of D2 in combination with D3.

D3 is a scientific abstract about a phosphorescent complex. Even if one assumes in the appellants' favour that this complex has a structure as defined in claim 1, D3 does still not suggest that this complex can be incorporated into the emitting layer of an OLED, let alone that thereby the range of emission colours of

an OLED could be expanded. Therefore, the skilled person starting from D2 and reading D3 would not have replaced the complex of D2 by that of D3 in order to solve the objective technical problem.

9.6.3 Appellants I and III furthermore argued that the subject-matter of claim 1 was obvious in view of D2 in combination with D7.

D7 is a scientific article disclosing the synthesis of iridium complexes having a formula as required by claim 1 (complexes 16 to 21 on page 192). Even if one assumes in the appellants' favour that the skilled person reading D7 would consider these complexes to be phosphorescent, the subject-matter of claim 1 is not obvious in view of D2 and D7. Firstly, D7 is in a technical field completely unrelated to that of OLEDs, namely that of biological marker molecules. The skilled person starting from D2 and being confronted with the objective technical problem would thus not even have considered D7. Secondly, even if the skilled person had looked into D7, he would not have found any motivation therein to use the complex disclosed in this document instead of that disclosed in D2 in order to expand the emission range of OLEDs.

9.6.4 Appellants I and III additionally argued that the subject-matter of claim 1 was obvious in view of D2 in combination with D8/D8b.

D8/D8b is a PhD thesis that discloses the synthesis of the complex $Irmppy_2pic$, which has a formula according to claim 1. Upon UV irradiation in dichloromethane, a bright green glow is observed (second sentence on page 286). Even if one assumes in the appellants' favour that this implies phosphorescence, the subject-

matter of claim 1 is not obvious in view of D2 and D8. Firstly, D8 is in an entirely different technical field than OLEDs, namely that of photochemistry (see reference to photo-reducing agents in the right-hand column on page 276 and to the redox potential of the excited state in the last sentence of the right-hand column on page 286 of D8b). The skilled person would therefore not even have considered D8/D8b when starting from D2 and trying to solve the objective technical problem. Furthermore even if the skilled person had considered this document, he would not have found therein any indication that by replacing the complex of D2 by that of D8/D8b, he would have solved the problem of expanding the emission range of OLEDs.

9.6.5 The appellants finally argued in the written proceedings that the subject-matter of claim 1 lacked an inventive step in view of closest prior art document D2 in combination with any of D6, D14, D15, D16, D18, D25, D27, D29, D30, D31 and D32.

However, in the same way as D3, D7 and D8, none of these documents suggests that by replacing one of the three identical ligands in the complex of D2, the problem of expanding the range of emission colours of OLEDs could be solved.

9.6.6 Consequently, the subject-matter of claim 1 and by the same token of all remaining claims is inventive in view of D2, taken alone as well as in combination with any of the further cited documents.

9.7 D4 as the closest prior art

9.7.1 Apart from D2, the appellants also used D4 as the closest prior art. It was a matter of dispute between

the parties whether this document constituted prior art under Article 54(2) EPC.

9.7.2 On the left-hand corner of the first page, D4 contains the following information:

"Pure Appl. Chem. Vol. 71, No. 11, pp. 2095-2106, 1999. Printed in Great Britain © 1999 IUPAC".

This seems to indicate that D4 has been published within the priority year of the opposed patent (1999). However, Ms Meyers, associate director of the International Union of Pure and Applied Chemistry, stated in her letter D49 that "the November 1999 issue (Vol. 71, No. 11) was printed on July 5, 2000" and that there was no release online before printing. The issue referred to in this letter is the one containing D4. D4 was thus published on 5 July 2000, i.e. after the priority date of the opposed patent. Consequently, D4 is not prior art under Article 54(2) EPC and thus not relevant to inventive step.

The title on the first page of D4 contains a reference to a footnote reading "Lecture presented at the 4th International Symposium on Functional Dyes - Science and Technology of Functional Π-Electron Systems, Osaka, Japan, 31 May - 4 June 1999, pp 2009-2160." The date mentioned in the footnote is before the priority date of the opposed patent. Appellant III argued during the written proceedings that the written disclosure of D4 was identical to the presentation given orally during the mentioned international symposium. However no proof was provided for this allegation. In fact, since D4 cites a document from the year 2000 (reference 11), which is after the date of this international symposium, it must rather be assumed that the content

of D4 is not identical to that presented orally at the symposium.

9.7.3 Irrespective of this, taking D4 as the closest prior art does not alter the finding on inventive step. In the same way as D2, it is directed to phosphorescent OLEDs and discloses $Irppy_3$. Hence, the same distinguishing feature is present and the same objective technical problem applies as with regard to D2.

9.7.4 Therefore, the appellant's inventive step attack starting from D4 as the closest prior art must fail.

9.8 The ground under Article 100(a) thus does not prejudice the maintenance of the patent in the form of the main request.

**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

   - claims 1 to 11 according to the main request filed during the oral proceedings of 5 March 2015;

   - the description pages 3 to 7, and 10 to 18 of the patent specification, and amended pages 8 and 9 of the description as filed during the oral proceedings before the opposition division on 7 December 2012; and

   - figures 1 to 40 of the patent specification.

The Registrar: The Chairman:

M. Cañueto Carbajo W. Sieber

Decision electronically authenticated