deposited at a thickness of about 350 Å, the Alq_3 electron transporting layer was deposited at a thickness of about 450 Å and the copper phthalocyanine (CuPc) or zinc phthalocyanine (ZnPc) were deposited at a thickness of about 60 Å. The top ITO cathode layer was RF sputter-deposited at low powers and had a thickness of about 650 Å. OLEDs were also prepared containing a CBP layer between the CuPc layer and the Alq_3 layer. Such OLEDs showed performance characteristics comparable to the OLEDs in which no CBP layer was present.

[**0097**] The devices were characterized by measuring the current-voltage, luminance-current, electroluminescence spectra and the transmission, reflection and absorption spectra. Representative data are shown in FIGS. **3-11**.

[**0098**] The results were compared with a standard OLED, for example, as shown in **FIG. 1**, which includes a metallic Mg:Ag cathode layer **1**, an electron transporting layer **2**, a hole transporting layer **3**, an anode layer **4** and a substrate **5**. The alpha-NPD hole transporting layer had a thickness of about 350 Å, the Alq_3 electron transporting layer had a thickness of about 450 Å and the Mg:Ag cathode layer had a thickness of about 1500 Å.

Example 2

[**0099**] An example of a non-metallic-cathode-containing TOLED of the present invention is shown schematically in **FIG. 13**. The device was grown, for example, as shown in G. Gu, V. Bulovic, P. E. Burrows, S. R. Forrest, and M. E. Thompson, *Appl. Phys. Lett.* 68, 2606 (1996), in a vacuum system with a base pressure $<10^{-7}$ Torr on a pre-cleaned glass substrate coated with ITO with a sheet resistance of 20 Ω/□. A 30 Å to 60 Å thick film of copper phthalocyanine (CuPc) was deposited on the ITO to improve hole injection, followed by a 350 Å to 400 Å thick film of the HTL:4,4'-bis[N-(1-napthl)-N-phenyl-amino]biphenyl(α-NPD). Next, a 400 Å to 500 Å thick film of the emissive ETL, tris-(8-hydroxyquinoline) aluminum (Alq_3), was grown, followed by a second 30 Å to 60 Å thick film of CuPc, S. A. Van Slyke, C. H. Chen, and C. W. Tang, *Appl Phys. Lett.* 69, 2160 (1996). The first 200 Å of Alq_3 was doped to 1% (by mass) with coumarin 6 (cm6). The substrate was then transferred to the ITO sputtering chamber where 400 Å to 600 Å of ITO was radio-frequency sputtered on top of the CuPc in an Ar (200 sccm) and O_2 (0.10 sccm) ambient at a pressure of 5 mTorr and a power of 5 W. For comparison, a conventional TOLED not having the highly transparent non-metallic cathode was fabricated along with the test device, in particular, this conventional TOLED had a similar structure with the difference that the ITO/CuPc top electrode was replaced with a 100 Å thick, semi-transparent film of Mg:Ag (30:1, mass ratio) deposited onto the Alq_3 surface, capped by sputtered ITO. A second series of non-metallic-cathode-containing TOLEDs was fabricated using zinc phthalocyanine (ZnPc) in place of CuPc under the top ITO layer. Finally, in a third series of devices, the electron injecting CuPc layer was replaced by a 60 Å thick layer of 3,4,9,10-perlyenetetracarboxylic dianhydride (PTCDA), which has previously been shown to be effective in protecting an underlying organic film from the damage that may otherwise be incurred during sputtering. V. Bulovic, P. Tian, P. E. Burrows, M. R. Gokhale, and S. R. Forrest, *Appl. Phys. Lett.* 70, 2954 (1997).

What is claimed is:

1. A cathode comprising an electrically conductive non-metallic layer in low-resistance electrical contact with a semiconductive organic layer.

2. The cathode according to claim 1 wherein the electrically conductive non-metallic layer is comprised of a wide band gap semiconductor having a band gap of at least 1 eV.

3. The cathode according to claim 1 wherein the wide band gap semiconductor has a transmission of at least 50% for incident and admitted radiation.

4. The cathode according to claim 1 wherein the semiconductive organic layer is comprised of a polyacene compound.

5. The cathode according to claim 1 wherein the semiconductive organic layer is comprised of a phthalocyanine.

6. The cathode according to claim 1 wherein the semiconductive organic layer is comprised of copper phthalocyanine.

7. The cathode according to claim 1 wherein the semiconductive organic layer is comprised of zinc phthalocyanine.

8. An optoelectronic device comprising a cathode comprised of an electrically conductive non-metallic layer in low-resistance electrical contact with a semiconductive organic layer.

9. The optoelectronic device according to claim 8 wherein the electrically conductive non-metallic layer is comprised of a wide band gap semiconductor having a band gap of at least 1 eV.

10. The optoelectronic device according to claim 8 wherein the wide band gap semiconductor has a transmission of at least 50% for incident and admitted radiation.

11. The optoelectronic device according to claim 8 wherein the semiconductive organic layer is comprised of a polyacene compound.

12. The optoelectronic device according to claim 8 wherein the semiconductive organic layer is comprised of a phthalocyanine.

13. The optoelectronic device according to claim 8 wherein the semiconductive organic layer is comprised of copper phthalocyanine.

14. The optoelectronic device according to claim 8 wherein the semiconductive organic layer is comprised of zinc phthalocyanine.

15. An organic light emitting device comprising a cathode comprised of an electrically conductive non-metallic layer in low-resistance electrical contact with a semiconductive organic layer.

16. The organic light emitting device according to claim 15 wherein the electrically conductive non-metallic layer is comprised of a wide band gap semiconductor having a band gap of at least 1 eV.

17. The organic light emitting device according to claim 15 wherein the wide band gap semiconductor has a transmission of at least 50% for incident and admitted radiation.

18. The organic light emitting device according to claim 15 wherein the semiconductive organic layer is comprised of a polyacene compound.

19. The organic light emitting device according to claim 15 wherein the semiconductive organic layer is comprised of a phthalocyanine.

20. The organic light emitting device according to claim 15 wherein the semiconductive organic layer is comprised of copper phthalocyanine.