NEW BIPOLAR DERIVATIVES WITH DIPHENYLSULFONE OR DIPHENYLPHENONE AS TADF BASED EMITTERS OLEDS

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To resolve the energy crisis, there has been huge interest in the development of lighting technologies that are energy-efficient, cleaner and more affordable. Organic light-emitting diodes (OLEDs), which are mainly formed of thin films of organic molecules, have been regarded as the sustainable and very attractive strategy to achieve the goal [1, 2, 3].

The TADF based emitters EM1–EM2 were prepared in reactions of the 3-(N,N-diphenylamino)-9H-carbazole with 9-(4-(4-fluorophenylsulfonyl)phenyl)carbazole or 4-(carbazol-9-yl)-4'-fluorobenzophenone , correspondingly.

Bipolar derivatives having thermally activated delayed fluorescence (TADF) functions were synthesized by multistep synthetic procedure by using 3-(N,N-diphenylamino)-9H-carbazole and 9-(4-(4-fluorophenylsulfonyl)phenyl)carbazole or 4-(carbazol-9-yl)-4

'-fluorobenzophenone in the final step. The materials have high thermal stabilities and form molecular glasses with very high glass transition temperatures of 140 oC - 143 oC.

The compounds were tested in multilayer TADF based organic light emitting diodes (OLEDs). The most efficient green device demonstrated low turn-on voltage of 2.2 V, maximum luminance of 60155 cd/m2 and high peak efficiency values of 12.1% (35.4 cd/A and 46.3 lm/W). At higher practical luminance of 100 cd/m2 or 1000 cd/m2, the device remained also highly efficient with 12.1% and 11.1%, correspondingly.

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