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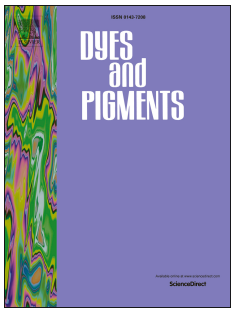

OLEDs based on the emission of interface and bulk exciplexes formed by cyano-substituted carbazole derivative

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OLEDs Based on the Emission of Interface and Bulk Exciplexes Formed by Cyano-Substituted Carbazole Derivative

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Abstract: Four carbazol-9-yl and diphenylamino substituted 9-ethylcarbazole derivatives having cyano groups in the substituents were synthesized and characterized by the experimental and theoretical tools. Thermal, optical, photophysical and electrochemical properties were studied. The derivatives exhibited moderate thermal stability with 5 % weight loss temperatures exceeding 300^{o}C. All the derivatives were found to be capable of glass formation with glass transition temperatures ranging from 77 to 111 ^{o}C. The optical band gaps of the solid samples were 2.84–3.38 eV. One of the derivatives was used for the preparation of blue non-doped emitting layer and as exciplex forming material for the fabrication of blue and yellow organic light emitting diodes with CIE color coordinates of (0.17, 0.28) and (0.40, 0.52), respectively. The electroluminescence of the yellow exciplexes based device resulted from the overlapping of sky blue bulk emission with photoluminescence quantum efficiency of 43.8% and orange interface exciplex emission with the efficiency of 3.84%. The fluorescent non-doped blue OLED exhibited maximum luminance of 2515 cd/m^2 and external quantum efficiency reaching of 2 %, while the yellow exciplex OLED exploiting the effect of thermally activated delayed fluorescence had maximum luminance of