Isophtaloylbisdibenzothiophene: a New Structural Moiety for the Engineering of Organic Triplet Emitters

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The presented work is on the study of the effects of crystallinity and management of triplet excitations of the derivatives of isophtaloylbisdibenzothiophene as a central electron-withdrawing core and various peripheral donor moieties such as diphenylamine, dimethylacridine, carbazole, and phenoxazine. The compounds exhibit high thermal stability, with the 5% weight loss temperatures varying from 445 to 525 °C. The derivative with phenoxazine donor units is a crystalline organic semiconductor (COS) as determined by differential scanning calorimetry and analysis of the morphology of the films. Ionization energies of the compounds range from 5.4 to 5.9 eV, depending on the donor strength. The analysis of PL spectra and decay curves of the films of the compounds doped in Zeonex recorded at the different temperatures point to the probable interplay of room temperature phosphorescence and thermally activated delayed fluorescence. The phosphorescence of the COS is blue-shifted when compared to the fluorescence. Its lifetime is in the range of seconds for both liquid and solid samples. The white organic light emitting diode fabricated utilizing the sky-blue Iridium complex FIrpic and the COS as a host for the red fluorescent emitter exhibits the color rendering index of up to 80 and the CIEx,y coordinates of (0.31, 0.34)-(0.33, 0.36) at the different voltages. The corresponding color correlated temperature ranges from 6115 to 7110 K. The obtained values are close to the CIE standard illuminant D65 of the white light.