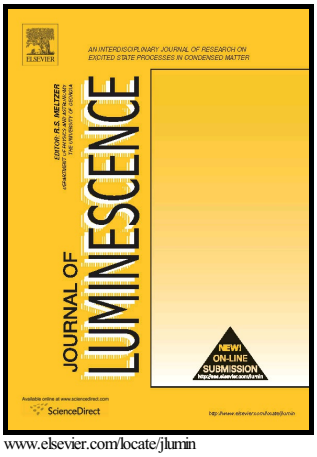

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Solution Processed Multilayer Red, Green and Blue Phosphorescent Organic Light Emitting Diodes using Carbazole Dendrimer as a Host

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Abstract

4, 4'-bis(3,6-bis(3, 6-ditert-pentyl-carbazol-9-yl)carbazol-9-yl)-2,2'-dimethylbiphenyl, a novel carbazole dendrimer, has been synthesized. This compound shows an excellent thermal stability with a high glass transition temperature of 283 ^{o}C and decomposition temperature of 487 ^{o}C. Density functional theory is used to investigate the frontier orbitals. It was found that the Highest Occupied Molecular Orbital and the Lowest Unoccupied Molecular Orbital levels of 4, 4'-bis(3,6-bis(3, 6-ditert-pentyl-carbazol-9-yl)carbazol-9-yl)-2,2'-dimethylbiphenyl are nearly degenerate to the next highest or lowest frontier orbitals. The electron rich outer dendrons along with Highest Occupied Molecular Orbital level of 5.24 eV as determined from cyclic voltammetry makes 4, 4'-bis(3,6-bis(3,6-ditert-pentyl-carbazol-9-yl)carbazol-9-yl)-2,2'-dimethylbiphenyl a good hole transporting material. This compound also shows a triplet energy of 2.83 eV. Solution processable multilayer red, green and blue phosphorescent organic light emitting diodes are fabricated having 4, 4'-bis(3,6-bis(3,6-ditert-pentyl-carbazol-9-yl)carbazol-9-yl)-2,2'-dimethylbiphenyl as a hole transporting host. It was found that the CIE-coordinates remain constant within a wide range of brightness.

Keywords: dendrimer, multilayer organic light emitting diode, solution process, carbazole

1. Introduction

Organic light-emitting diodes (OLEDs) have attracted great attention in academic [1] and industrial interests [2] for flat panel displays [3] and solid-state lighting [4-7]. Currently OLEDs are dominated by small molecules which often require vacuum deposition. This increases the cost of production. Solution process light emitting polymers offer the possibility of using large scale roll to roll