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Synthesis and photoluminescence properties of europium(III) complexes sensitized with β-diketonato and N, N-donors ancillary ligands

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Abstract

Synthesis of three new europium(III) complexes with 1,3-[bis(4-methoxyphenyl)]propane-1,3-dionato (HBMPD) ligand and ancillary ligands such as 2,2′-biquinoline (biq) or neocuproine (neo) has been reported in this report. The synthesized complexes were characterized by IR (infrared), ^{1}H and ^{13}C-NMR (nuclear magnetic resonance) spectroscopy, CHN (carbon, hydrogen and nitrogen) elemental analysis, XRD (X-ray diffraction), TGA (thermogravimetric analysis) and photoluminescence (PL) spectroscopy. The emission spectra of europium(III) complexes displayed both the low intensity $^{5}D_{1\text{-}3}\rightarrow{}^{7}F_{0\text{-}3}$ transitions in 410-560 nm blue-green region and high intensity characteristic $^{5}D_{0}\rightarrow{}^{7}F_{0\text{-}3}$ transitions in 575-640 nm orange-red region correspond to the emission of ancillary ligands and europium ion respectively, which can lead to white luminescence due to integration of blue, green and red color emissions. The photoluminescence investigations indicate that the absorbed energy of the HBMPD ligand transferred to the central europium(III) ion in an efficient manner, which clearly explained by antenna effect. The excellent results of thermal behavior and photophysical properties like luminescence spectra, CIE (Commission Internationale Eclairage) chromaticity coordinates, luminescence decay curves