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ENERGY TRANSFER IN TUNABLE LUMINESCENT MULTICOLOR PMMA FILMS DOPED WITH RE^{3+}-β-DIKETONATE COMPLEXES

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Trivalent Rare Earth (RE^{3+}) β-diketonate complexes and polymethylmetacrylate (PMMA) have been widely employed in the productions of luminescent materials [1]. In this work, preparation, characterization and photoluminescence studies for a series of stand-free polymer thin films incorporating RE^{3+}-β-diketonate complexes into PMMA are reported [2].

Large Ω_2 and η(emission efficiency) values are obtained with PMMA:x%[$Eu(tta)_3(H_2O)_2$] system, indicating that: 1) the Eu^{3+} ions are located in a highly polarizable environment with non-centrossymmetric symmetry and 2) the polymer operates as a co-sensitizer, providing an additional sensitization channel and enhances the monochromatic emissions arising from the characteristic RE^{3+} 4f–4f intraconfigurational transitions. Furthermore, it was observed colour-tuneable luminescence with the polymer films co-doped with [$Eu(tta)_3(H_2O)_2$] and [$Tb(acac)_3(H_2O)_3$]. More importantly, both the excitation wavelength and the [Eu]/[Tb] concentration ratio can be adjusted to fine-tune the emitting colour from red to green (Fig. 1). Therefore, this polymeric system is potentially attractive for advanced photonic applications such as multicolour anti-falsification, optical markers, full range UV sensors etc.

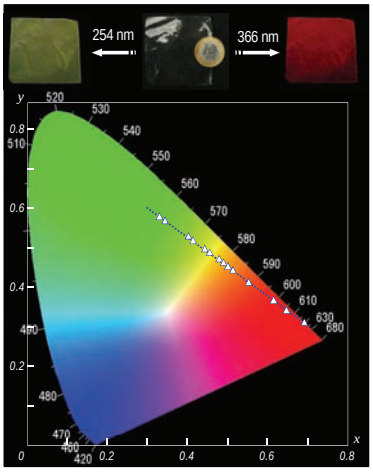

Fig. 1. CIE chromaticity diagram showing the x,y emission colour coordinates of polymer films.

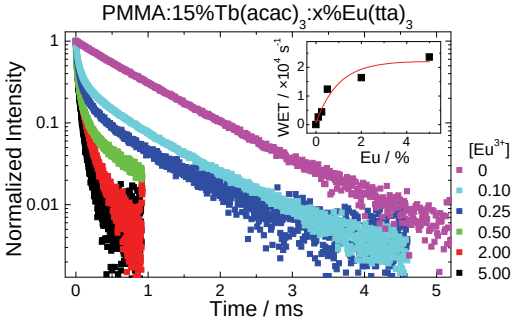

Fig. 2. Luminescence decay curves, monitoring the excitation at 355 nm and emission at 545 nm. The inset figure shows the curve of W_{ET} vs. [Eu].

Moreover, an intermolecular energy transfer between the luminescent species in the polymer matrix is observed and to the best of our knowledge, unprecedented in the literature (Fig. 2).

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