

Co-fluorescence enhanced tuneable emission of lanthanide β -diketonate complexes in solid thin films.

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The intermolecular energy transfer between $(N(C_2H_5)_4)[Ln(hfa)_4]$ ($Ln=Sm, Eu, Gd, Tb, Lu$; hfa =hexafluoroacetylacetone) complexes in solid-state thin films was investigated in this paper. Due to thermal stability of complexes the transparent thin films may be obtained both by melt processing and vacuum vapour deposition techniques, which is an important advantage of the studied compounds. The experimental results show that addition of Gd-complex enhances the emission of Eu- or Sm-complex by several hundred times compared to that calculated in absence of enhancing effect. The enhancement originates from intermolecular and intramolecular energy transfer processes and in some cases (e.g., Sm^{3+}) it is also due to diminished concentration quenching rate. The excitation energy may be transferred to $4f^n$ levels of emitting ion not only from the ligand's triplet level but also from $4f^n$ levels of adjacent molecules. In addition, the possibility of energy migration between triplet levels of ligands coordinated to diamagnetic Ln^{3+} ions is also indicated. Using the vacuum vapour deposition technique a good quality thin films of β -diketonate complexes were fabricated and their spectroscopic properties investigated. Importantly, the intermolecular energy transfer processes leading to enhanced luminescence also occurs in such materials. Moreover, emission colour tuneability of fabricated thin films may be easily achieved not only by tailoring the films composition but also by changing the excitation wavelength.

Słowa kluczowe

rare-earth, β -diketonates, Co-fluorescence, Co-luminescence, Thin film

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