Crystal structures and luminescent properties of bis(dibenzoylmethanate)nitratelanthanide(III) complexes

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This work reports on the structural and luminescent properties of the lanthanide β-diketonate complexes, $Ln(dbm)_2(NO_3)L_2$, where Ln = Eu, Tb, or Gd; dbm represents the dibenzoylmethanate ligand; and L is a neutral ancillary ligand such as trioctylphosphine oxide (topo), triphenylarsine oxide (tpAsO), or tricyclohexylphosphine oxide (tchpO). All eight-coordinate complexes occur as discrete molecules, with coordination involving the oxygen atoms of two dibenzoylmethanate ligands, one chelating nitrate ligand, and two monodentate neutral ligands.[1] Structural data show that the complexes with different lanthanide ions are isomorphous and crystallize in monoclinic ($P2_1/n$ or $P2_1/c$) or triclinic (P_{-1}) space groups. Interestingly, the system containing the tpAsO ligand includes approximately 0.6 ethanol molecules of crystallization per formula. The photoluminescent properties of the Eu^{3+} complexes were evaluated based on intensity parameters (Ω_λ), radiative (A_{rad}) and nonradiative (A_{nrad}) decay rates, the lifetime of the emitting state (τ), and quantum emission efficiency. Theoretical studies using the JOYSpectra platform [2] further support an efficient intramolecular ligand-to-metal energy transfer process, corroborating the experimental results.

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References

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