Synthesis of Luminescent Complexes of Lanthanides with New O,N-Tetradentate Ligands

Gradova, Anna (School: Moscow South-Eastern School Named After V. I. Chuikov)
Okladnikov, Ilya (School: Moscow South-Eastern School Named After V. I. Chuikov)

Coordination complexes of lanthanides possess bright luminescence with high quantum yields and long lifetimes. This allows applying them in a variety of fields such as: optoelectronics, cryptography and biomedicine. The aim of our work was synthesis and characterization of luminescent complexes of europium with diamides of 2,2'-bipyridine and di-N-oxides of 1,10-phenanthroline with various substituents in amide- and N-oxide-groups. Diamides of 2,2'-bipyridine were synthesized from 6,6'-dimethyl-2,2'-bipyridine. 6,6'-dimethyl-2,2'-bipyridine was oxidized by chromic anhydride to form 2,2'-bipyridine-6,6'-dicarboxylic acid, which was then turned into acyl chloride using oxalyl chloride and dimethylformamide as a catalyst. Target diamides of bipyridinedicarboxylic acid were synthesized by acylation of secondary amines (diphenylamine, diethylamine and pyrrolidine) with prepared acyl chloride. Di-N-oxides of phenanthroline were synthesized from 2,9-dichloro-1,10-phenanthroline. 2-chloro-9-amino- and 2,9-diamino-substituted phenanthrolines were prepared using the reaction of 2,9-dichlorophenanthroline with secondary amines (dibutylamine and N-ethylaniline). Diamines of phenanthroline were oxidized by meta-chloroperoxybenzoic acid (m-CPBA) to form corresponding di-N-oxides. We had synthesized two luminescent complexes of europium: with pyrrolidine amide of 2,2'-bipyridine-6,6'-dicarboxylic acid and with 2,9-bis(dibutylamino)-1,10-phenanthroline di-N-oxide. Structures of complexes were confirmed by HNMR, IR spectroscopy and mass spectrometry. Both complexes possess bright luminescence, for both of them were recorded excitation, emission and absorption spectra. Lifetimes and quantum yields of luminescence were also calculated.

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