



Highly luminescent bismuth complexes: Aggregation induced phosphorescent and polymorphism-dependent emission

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Auteur	Toma, Oksana [1], Mercier, Nicolas [2], Allain, Magali [3], Dul, Marie-Claire [4], Forni, Alessandra [5], Botta, Chiara [6]
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Mots-clés	aggregation [7], bismuth complexes [8], crystal structures [9], luminescence [10]
Résumé en anglais	<p>The search of simple ligand based metal-organic materials exhibiting Aggregation Induced Emission (AIE) or phosphorescence (AIP) effects and strong luminescence in the solid state is of high interest. Recently, we demonstrated that bipyridine derivatives consisting of one pyridinium cycle (acting as electron acceptor) and one pyridyl (N-methyl-4,4'-bipyridinium)¹ or one pyridyl-N-oxide part (N-R-N'-oxide-4,4'-bipyridinium, R= methyl, H)² were able to bind bismuth ions, giving complexes with photochromic and average luminescent properties.</p> <p>In this communication, we will report the results of our investigations in the Bi(III)/L systems, where L= bipyridinium based ligands of N-oxide type (N-oxide-4,4'(2,2')-bipyridinium (bp4mo and bp2mo) and N,N'-dioxide-4,4'-bipyridinium (bp4do)). More recently, we synthesized a 2D CP in which the bp4mo ligand acts as a bridge between two Pb²⁺ ions,³ but no bismuth complexes or CP based on bp4mo (bp2mo) or bp4do have been mentioned up to now.</p> <p>The impressive solid state Quantum Yields (QY) -up to 85% for (TBA)[BiBr₄(bp4mo)]- are obtained for several materials while others are non-luminescent. The three polymorphs α- (QY= 20%), β- and γ-[BiBr₃(bp2mo)₂] (QY= 0) will be given as examples. These structure-property relationships are assigned to environment rigidity or interactions between ligands in the solid state. A complete study of the luminescent properties (100-300 K range, lifetime, solid state and solution measurements) combined with DFT calculations and the analysis of the crystal structures shows that the lighting phenomenon is of AIP type which is induced by complex (Figure 1).</p>
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