Intra-molecular energy transfer and sensitized luminescence in complexes of actinide ions with multidentate nitrogen ligating heterocyclic ligands.

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Direct f - f excitations in actinide and lanthanide ions are inherently inefficient, as they represent Laporte forbidden transitions. One strategy used to circumvent this low absorbitivity involves coordination with energy-transmitting ligands, usually one with chromophores having high molar extinction coefficients. Previous studies involving "sensitized" emissions in transuranium complexes have been limited to β–diketonate systems, where oxygen linkages are encountered. Herein we report examples of efficient energy-transfers from N-donor multidentate, benzimidazole-type ligands to transuranium ions. Complexation of the actinide ions with these ligands provides luminescence enhancement of several orders magnitude. An example of this enhancement is intra-molecular energy-transfer (ET) from the triplet excited state of the ligand to the Cm(III) ion. Tuning of the donor/acceptor electronic levels can be accomplished by varying the e-donating/withdrawing abilities of the substituents on the ligand. The consequences of these modifications on the efficiency of energy-transfer will be discussed.