ABSTRACT

Studies of Lanthanide Complexes by a Combination of Spectroscopic Methods

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Since conventional structural analysis offers rather limited means for the chirality detection, a series of lanthanide tris-(*β*-diketonates) are investigated as effective receptors for a better chirality sensing in biomolecular substrates. These lanthanide complexes containing *β*-diketonate ligands are electrically neutral; they can further coordinate with various small organic molecules such as chiral alcohols, amino alcohols or amino acids in organic solvents and produce a strong chiral signal.

Previously, a resonance in Raman scattering was observed in the studied systems due to the correspondence of europium electronic transition energy to the laser excitation wavelength, about a 100-fold signal enhancement if compared to non-resonant vibrational ROA was observed. This enabled shorter detection times as well as lower sample concentrations.

In the current work, interaction of the Eu(FOD) complex with *(R)*- and *(S)*-enantiomer of 1-phenylethanol in n-hexane was studied using IR spectroscopy, Raman spectroscopy and Raman optical activity (ROA), UV-Vis spectroscopy and ultraviolet circular dichroism (UVCD). Only ROA and UVCD spectroscopies proved to be sensitive enough to the complexation of the studied chemical species.

The UVCD proved especially useful to support the results obtained by ROA measurements and determine the metal/ligand ratio in the complex. Although lanthanide tris-(*β*-diketonates) are silent in UVCD spectra, symmetric UVCD signals induced around 300 nm were observed for Eu(FOD) upon complexation with *(R)*- and *(S)*- 1-phenylethanol.

In the future, experiments with structural variations of lanthanide tris-(*β*-diketonate) complexes and theoretical modeling are planned to refine the chirality sensing systems for chiral recognition in biological substrates.

Key words: *Lanthanide Complexes, Europium, Raman Optical Activity, Resonance, Circular Dichroism, Quantum Mechanics, Chirality, Molecular Structure.*