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SJSU Undergraduate Research Grants

Investigation of Europium(III) Emission and Circularly Polarized Luminescence of Europium(III) Coordinated to Oxytetracycline in a Slightly Basic Environment

Shing Cho Ma and Dr. Gilles Muller

Department of Chemistry

San José State University, San José, CA 95192-0101

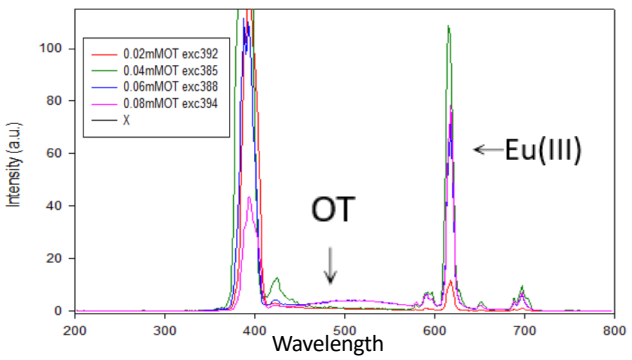
Abstract

Ln(III) luminescence spectroscopy has been found to be a complementary tool for discovering absolute structures because the luminescence of Ln(III) complexes often show large circularly polarized emissive properties. Eu(III), the most emissive member of the Ln(III) series, is often used along side of tetracycline (TC) derivatives for such purpose. As TC derivatives are capable of transferring energy to Eu(III) and the strong attraction between them prevents quenching effect (i.e., Eu(III) luminescence). This research focuses on discovering the different luminescence properties of Eu(III)-oxytetracycline (OT) complexes when the ratio of Eu(III):OT is varied.

Project Activities

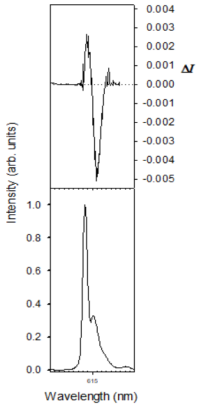
- Eu(III)-OT samples were made with varying ratios of Eu(III) and OT in an aqueous medium and at pH 8.
- Each of the samples have the same concentration of Eu(III), while the concentration of OT was increased by 1 eq. in each sample.
- Steady-state and time-resolved luminescence measurements were taken for all samples.
- The most emissive luminescence sample was analyzed by circularly polarized luminescence (CPL) to evaluate the polarization of the emitted light.

Steady-State Luminescence Spectra of Eu(III):OT Samples



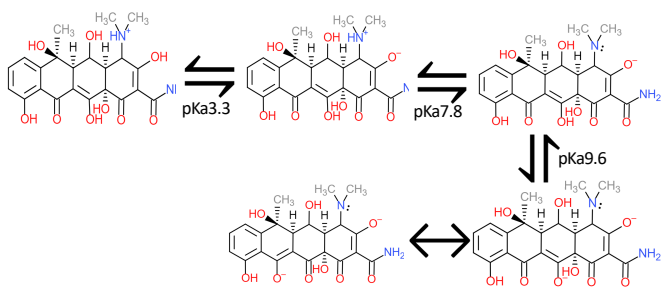
Eu(III)-OT complex emits the most intensive luminescence at the ratio of 1:2 Eu(III):OT, and non-coordinated OT exists in samples with over 2 eq. of OT

CPL Spectrum of 3.3 mM:1.5 mM Eu(III):OT Solution



1:2 Eu(III)-OT complex shows mildly strong right circularly polarization at 614.0 nm, and intensive left circularly polarization at 615.6 nm.

Deprotonation Scheme of OT



Research Questions

1. How does the pH play a role in the formation of the complex and their luminescence intensity?
2. How does the circularly polarization of the samples with less or more OT change compared with the 1:2 Eu(III):OT sample?
3. How does the circularly polarization of the luminescence change with the existence of chiral biological molecule?
4. Does the circularly polarization luminescence differ at other pHs?
5. How does the luminescence intensity change with the existence of chiral biological molecule?