UCMERCED | CHEMISTRY & BIOCHEMISTRY

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CHEMISTRY & BIOCHEMISTRY SEMINAR SERIES:

Enhancing Molecular Analysis with Circularly Polarized Luminescence Spectroscopy: A Valuable Methodology

Abstract:

Understanding the interaction between metal ions and biologically active molecules hinges on exploring chirality and spatial anisotropy. Hence, substantial endeavors have been directed towards devising precise analytical methods for distinguishing the structural aspects of these substances. A notable approach involves utilizing lanthanide(III), Ln (III), ions in spectroscopy to create intricately coordinated chiral compounds that emit light with circular polarization. This facilitates the direct observation of minute alterations in the surrounding environment that impact the luminescent characteristics of these complexes. Unlike circular dichroism (CD) spectroscopy, this method—referred to as circularly polarized luminescence (CPL)—exclusively identifies the active CPL components and remains unaffected by disruptive background signals.

Our focus in initiating this project is to underscore the significance of employing Ln(III) CPL spectroscopy in examining the chiral configurations of metal-based (biological) systems. The primary objective is to create intelligent imaging probes that offer quantifiable, highly responsive, and readily understandable outcomes.

Gilles Muller

Professor

Department of Chemistry

San Jose State University

About the Speaker:

Prof. Gilles Muller earned his B.S. and M.S. in Chemistry at the University Louis Pasteur in Strasbourg (France). He received his Ph.D. in Coordination Chemistry from the University of Lausanne (Switzerland) in 2000, under the supervision of Prof. Jean-Claude G. Bünzli. After his teaching postdoctoral stay at the University Minnesota Duluth in the research group of Prof. James P. Riehl, he joined the faculty at San José State University in 2004. He was promoted to Associate Professor (2008), Professor (2011), and was the Chair of the Department of Chemistry (2012-2015), the Director of Nuclear Science (2012-2015), and the Associate Dean of Research in the Office of Research from 2015 to 2019.

In 2008, he was the recipient of one of the highly competitive Henry Dreyfus Teacher-Scholar awards for his accomplishments in scholarly research with undergraduates, as well as compelling commitment to teaching. His research interests focus on the design of luminescent lanthanide(III) complexes with chiral ligands as potential probes of more complex molecules, e.g., biomolecules, by preferential interaction with one enantiomer for instance. This work includes the use of various spectroscopic techniques such as circularly polarized luminescence (CPL), fluorescence, UV-Vis, and NMR for the characterization of such compounds and elucidation of their structure. In addition, the lanthanide(III) luminescence is used as a probe of structures, dynamics, and excited state energetics of metal-containing compounds. The results of his research at San José State University have been published, to date, in over 90 refereed and high impact journals, and have been presented at domestic and international research conferences. Exceptionally, the majority of these articles present the work of outstanding undergraduate students (over 70 of the SJSU peer-reviewed publications involved the research work of over 50 outstanding undergraduate students listed as co-authors) who appreciated the unique opportunity to be involved in cutting-edge research early on in their careers. A complete list of publications can be found at http://www.sjsu.edu/people/gilles.muller/publications/.

You can find more information on my webpage at http://www.sjsu.edu/people/gilles.muller/ and in particular at http://www.sjsu.edu/people/gilles.muller/bio/ if needed.

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