INORGANIC CHEMISTRY SEMINAR

Prof. Henry S. La Pierre

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"Electron (De) Localization in *f*-Element Systems: From Fundamental Questions to QIS Design Principles"

Abstract: The La Pierre group studies how collective magnetic, physical, and chemical properties arise from electron (de)localization phenomena in *f*-element systems. Our studies include the development of solid-state and solution methodologies for the synthesis of novel lanthanide and actinide (Th – Pu) materials and complexes. These synthetic efforts are paired with synchrotron and neutron spectroscopies and physical property studies to break down the challenge of understanding the electronic structure of *f*-element systems. Particularly in solid-state systems, the *f*-elements present unique valence electronic structures due the near degeneracies engendered in these systems and strong electron correlation. Our efforts to-date have focused on the synthesis and analysis of systems governed by one of three phenomena: magnetic super-exchange (*i.e.* exchange coupled systems), multi-configurational electronic structures (ground state degeneracy including hybridization with ligand/band states), and mixed-valence metal ions (*i.e.* mixed *f/d* occupancy and mixed-oxidation states). Understanding and controlling the manifestation of these phenomena in molecular systems is crucial for understanding the interplay of these phenomena underpinning topological insulators such as SmB_6 and PuB_6 and superconductors such as $CeCoIn_5$ and $PuCoGa_5$. In turn, the group has employed this expanded fundamental understanding of *f*-element electronic structure to construct components of quantum information technologies (*e.g.* qubits, single-molecule magnets).

Wednesday, May 5th 2021

4:00 p.m. | Via Zoom

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