

Chemical Control of Spin in the Synthesis of Metal-Organic Magnets and Molecular Magnetic Resonance Probes

This presentation will describe our efforts to employ coordination chemistry in controlling the magnetic properties of two classes of compounds: (1) metal-semiquinoid radical magnets and (2) responsive magnetic resonance (MR) probes. *Part 1:* Molecule-based metal-organic magnets offer several key advantages over their inorganic analogues, most notably chemical programmability and control. These compounds may find use in applications including lightweight permanent magnets and spin-based information processing. All applications would benefit from a higher operational temperature, which is directly correlated to the strength of magnetic interactions. Toward this end, we are working to synthesize metal semiquinoid molecules and extended networks that feature strong magnetic exchange coupling between metals and ligand radical linkers. This presentation will describe the synthesis and properties of new radical-bridged compounds comprising dinuclear molecular complexes and two-dimensional layered networks. *Part 2:* Spatial variation of properties such as redox status, temperature, and pH of intra- and extracellular environment is closely associated with a number of biological processes and diseases. We are working to design paramagnetic MR probes that undergo changes in magnetic behavior in response to changes in these properties, where these changes can then be translated to MR spectra or images. This presentation will describe the employment of spin-crossover Fe^{II} complexes as MR thermometers and dinuclear complexes for the ratiometric quantitation of solution redox status and pH.