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**Monday, 9 September 2024**

**4:00 pm in 303 Schrenk Hall**

**Structural Evaluation of Laser Ablation Products of Actinide- and Lanthanide- Containing Molecules using Chirp-Pulsed Fourier Transform Microwave (CP-FTMW) Spectroscopy**

**Abstract:** As the global demand for alternative sources of energy increases, nuclear power could be seen as an efficient producer of energy. However, the United States only utilizes nuclear power for roughly 8% of its total energy usage. In order to more safely and effectively harness nuclear power, a fundamental understanding of the bonding mechanisms of actinide- and lanthanide- containing molecules is necessary—particularly with regards to contributions from f-electrons. Microwave or rotational spectroscopy, depending on if one is speaking of the frequency of light utilized or the physical motion of the molecules in the experiment, is a method of structural determination. Rotational spectra were recorded on the CP-FTMW spectrometer equipped with a laser ablation source located at the Missouri University of Science and Technology. The CP-FTMW spectrometer is an instrument capable of quickly collecting broadband microwave spectra. The laser ablation setup consists of a metal rod that is struck by a focused Nd:YAG laser outputting the 1064 nm fundamental, generating a plasma. For the systems discussed in this talk, a gas mix of carbonyl sulfide (OCS) in an argon carrier gas is pulsed over the metal plasma, where it is allowed to react. The products of this reaction are entrained in a supersonic expansion where they can be monitored by the CP-FTMW instrument, and the spectra analyzed for structural insights. This presentation will cover the fundamentals of microwave spectroscopy, structural determinations, and comparisons to theoretical values.