Chemistry and Biochemistry

Fall 2021 Zoom Seminar

Please join us for the following seminar!

PRINCETON UNIVERSITY

Speaker:

Marissa Weichman, Assistant Professor

When:

Friday, October 22nd
1:00 pm

Where:

On Zoom
bit.ly/chicochem

Molecules in Optical Cavities: Precision Spectroscopy & Strong Light-Matter Interactions

In this seminar, I will discuss some of the major results from my postdoctoral work at JILA/CU Boulder, as well as the in-progress work and future research plans of the Weichman Lab, which launched in July 2020 at Princeton Chemistry.

Precision frequency comb spectroscopy can be used to interrogate the quantum structure of unprecedentedly large molecular species. Frequency combs are light sources consisting of thousands of evenly spaced, sharp frequency “teeth.” Cavity-enhanced frequency comb spectroscopy (CE-FCS) matches a comb’s evenly spaced spectral structure to the resonant modes of an optical cavity. This method allows for simultaneous detection of absorption signal across the comb spectrum, extremely high frequency resolution, and high sensitivity as the cavity enhances the interaction length between light and sample. We combined buffer gas cooling of large molecules with CE-FCS in order to measure the rovibrational structure of buckminsterfullerene (C_{60}), a molecule of great fundamental and astrochemical interest and a longstanding spectroscopic challenge. I will discuss the details of these measurements, which represent the first direct probe of the quantum state-resolved structure of C_{60} and establish it as by far the largest molecule for which a state-resolved spectrum has been reported.

Moving forward, the Weichman Lab is interested in continuing to push the boundaries of molecular spectroscopy, using molecular cooling techniques and novel spectroscopies to characterize complex systems on the brink of treatment with standard tools. We are also particularly interested in the chemistry of polaritons, Schrödinger’s cat-like superposition states with hybrid light-matter character which can be engineered inside optical cavities. Polaritons inherit the wavelike nature of light while maintaining local molecular interactions and structure. It should therefore perhaps not come as a surprise that the reactivity of polaritonic molecules may be quite distinct from their ordinary uncoupled counterparts. I will discuss some of our in-progress work to build a detailed picture of how molecular polaritons behave, using both ultrafast and precision spectroscopy to follow reaction dynamics under strong light-matter coupling.

Department of Chemistry and Biochemistry
CSU, Chico
400 West First Street
Chico, CA 95929-0210
(530) 898-5259
www.csuchico.edu/chem/seminars
chem@csuchico.edu