

Seminar on

# Modern Optics and Spectroscopy

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*Ultrafast (XAFS) measurement of solvated transition metal complexes*

November 2, 2004  
12:00 – 1:00 p.m.

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## Abstract

Ultrafast high-intensity laser pulses incident upon condensed matter targets can generate high-density plasmas that emit x-ray pulses with sub-picosecond temporal structure, significant spatial coherence, and high brightness. Such a laser-driven plasma x-ray source operating at kilohertz repetition rates has been developed in our laboratory. Details of the experimental apparatus, including the x-ray optics are presented. Essential performance features related to ultrafast time-resolved x-ray absorption fine structure (XAFS) spectroscopy are discussed.

Structural parameters of solvated  $\text{Fe}(\text{CO})_5$  were measured by XAFS spectroscopy using our ultrafast laser driven x-ray source. The spectra are compared to XAFS spectra measured with a micro-focus as well as a synchrotron x-ray source. Furthermore, the data are compared to theoretical XAFS spectra based on Density Functional Theory (DFT) calculations of the solvated complex. All experimental and theoretical structure data were found to be in close agreement.

Laser-pump XAFS-probe measurements of  $\text{Fe}(\text{CO})_6^{4+}$  in water have been performed at various pump-probe delay times before and after UV-photoexcitation of the complex. The experimental results are discussed and measured picosecond time-resolved XAFS spectra are presented.

Grier Room, MIT Bldg 34-401  
Refreshments will be served