

## Microsymposium

**MS06.O01**

### *Atom Specific Ultrafast Surface Chemistry using a Soft X-ray Laser*

A. Nilsson<sup>1</sup>

<sup>1</sup>*SLAC National Accelerator Laboratory, SUNCAT ctr for interface science and catalysis, Menlo Park, CA, USA*

Catalysis is central for many chemical energy transformations that occur at interfaces. One of the dreams is to follow catalytic reactions in real time from reactants over various intermediates to products. The prospective for the study of chemical reactions on surfaces using X-ray free-electron lasers (Linac Coherent Light Source, or LCLS, at SLAC National Accelerator Laboratory) will be presented. We induced the hot electron and phonon mediated excitation of adsorbates on Ru(0001) with synchronized excitation by a femtosecond optical laser pulse. We have followed the ultrafast evolution of the bond distortions, weakening and breaking, using x-ray absorption spectroscopy and x ray emission spectroscopy resonantly tuned to the oxygen core level with ultrashort x-ray pulses delivered from LCLS. We can directly follow the time evolution of the molecular orbitals in an atom-specific way on a subpicosecond timescale. Three examples will be shown CO desorption, Oxygen activation and CO oxidation on Ru(0001).

**Keywords:** Surface Chemistry, X-ray spectroscopy