**Cartography with Clusters: Mapping Surface Science Mechanisms with Atomic Precision**

The most important global chemical processes rely on multimetallic catalysts that facilitate difficult bond making and bond breaking transformations. Many of these catalysts take the form of evolutionarily optimized enzymatic machinery, while equally vital are engineered heterogeneous catalysts used in large-scale industrial chemical transformations. A significant challenge in optimizing existing catalysts and discovering or designing new ones is *the lack of fundamental mechanistic understanding of the elementary chemical processes taking place at the active site*. My research group addresses this knowledge gap by employing inorganic synthesis to prepare and study multimetallic complexes that adopt design features prevalent in both industrial and enzymatic catalysis. This talk will describe the synthesis of an unusual, low-valent multicopper cluster that serves as a soluble fragment of crystalline Cu(111). Studies investigating small molecule binding and activation, as they pertain to substrate adsorption and chemisorption, are presented. This platform also facilitates surface-like catalytic transformations of NOx reagents, unsaturated hydrocarbons, and carbon oxygenates. These chemistries, including insights into their respective mechanisms, will be compared to prevailing mechanistic proposals in surface science.

Professional Website: https://sites.lsa.umich.edu/jbuss/