Title: " Atomic-Scale Structure and Non-Stoichiometry of Meteoritic Hibonite"

Abstract:
Hibonite ($CaAl_{12}O_{19}$) is a common refractory mineral in Ca-Al-rich inclusions (CAIs) in primitive meteorites and provides crucial insights into the conditions and processes that existed in the early solar nebula. Transmission electron microscope (TEM) studies have identified enigmatic planar defects in different occurrences of hibonite in the Allende meteorite. Atomic resolution high-angle annular dark-field (HAADF) imaging and energy dispersive X-ray (EDX) analyses were used to determine the nature and origin of these planar features. Our TEM analyses revealed that the modification of the stacking sequence in hibonite and its non-stoichiometry (i.e., Al and Mg excesses) likely played a major role in the formation and metastability of planar defects in hibonite. The formation history of planar defects in hibonite will be discussed to provide implications on the formation conditions for refractory first solids in the early and high-temperature evolution stage of our Solar System.