MM 18: Invited talk Baldi

Time: Tuesday 9:30–10:00 Location: TC 006

Invited Talk MM 18.1 Tue 9:30 TC 006

Hydrogen storage in individual metal nanoparticles — •Andrea Baldi[1,2], Tarun Narayan[2], Fariah Hayee[2], Ai Leen Koh[2], Robert Sinclair[2], and Jennifer Dionne[2] — [1]DIFFER - Dutch Institute for Fundamental Energy Research, Eindhoven, The Netherlands — [2]Stanford University, Stanford, USA

Many energy- and information-storage processes rely on phase transformations of nanomaterials in reactive environments. Compared to their bulk counterparts, nanostructured materials exhibit fast charging and discharging kinetics, resistance to defects formation, and thermodynamics that can be modulated by size effects. However, in ensemble studies of these materials, it is often difficult to discriminate between intrinsic size-dependent properties and effects due to sample size and shape dispersity. Here, we use a wide range of in-situ transmission electron microscopy techniques to reconstruct the absorption of hydrogen in individual palladium nanocrystals. Using electron energy-loss spectroscopy, dark-field imaging and electron diffraction, we shed light on the role of surface energy, crystallographic defects, and lattice strain on the thermodynamics and kinetics of phase transformation in these nanostructured systems (1-3). Our results provide a general framework for studying phase transitions in individual nanocrystals and highlight the importance of single-particle approaches to the characterization of functional nanomaterials.

(1) Baldi et al., Nature Materials 13, 1143-1148 (2014); (2) Narayan et al., Nature Materials 15, 768-774 (2016); (3) Narayan et al., Nature Communications 8, 14020 (2017).