

# Bragg Coherent Diffraction Imaging of Structural Evolution of Nanocrystals

Tailored surfaces in operando conditions - a Marcus Wallenberg symposium  
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The Bragg Coherent Diffraction Imaging (BCDI) method will be introduced as a way to see lattice distortions in small crystals [1]. Because of the use of penetrating X-rays, BCDI has great potential for operando and *in-situ* investigations of catalysts and battery materials, which has already motivated the building of new beamlines at Synchrotron Radiation facilities. I will illustrate the possibilities of operando BCDI with two recent examples from our group. Alloying is widely thought to be a homogeneous process, but distinct diffusion gradients and porosity evolution can be identified in the Cu-Au nanoparticle system. Intermetallic diffusion is found to be significantly faster in nanoparticles than the equivalent bulk system [2]. Crystal growth and dissolution of calcite crystals was studied *in situ* in solution by varying their exposure to CO<sub>2</sub>. Smooth facets were seen on the micron-sized crystals in the growth direction while the retreating surfaces were found to be rough [3].

[1] Coherent Diffraction Imaging of Strains on the Nanoscale Ian Robinson and Ross Harder, Nature Materials 8 291-298 (2009)

[2] Atomic Diffusion within Individual Au Nano-crystal Gang Xiong, Jesse N. Clark, Chris Nicklin, Jonathan Rawle and Ian K. Robinson, Nature Scientific Reports 4 6765 (2013)

[3] Three-dimensional imaging of dislocation propagation during crystal growth and dissolution Jesse N. Clark, Johannes Ihli, Anna S. Schenk, Yi-Yeoun Kim, Alexander N. Kulak, James M. Campbell, Gareth Nisbit, Fiona C. Meldrum and Ian K. Robinson, Nature Materials 14 780-784 (2015)

