



College of Liberal Arts and Sciences
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Lattice Planes, Crystal Facets, and Nanoparticle Shape Control

Abstract: An exciting recent development in chemistry has been the ability to control nanoparticle crystal morphology, or shape. Nanoparticles of different shapes present different crystal surfaces (or facets) to the surrounding environment. Synthetic control over nanoparticle morphology has enabled the study of the influence of surface facets on the catalytic properties of nanoparticles. Here, these recent advances are leveraged as a theme to introduce and review the use of Miller indices to describe crystal planes, facets, and the directions of growth of metal nanoparticles. Inexpensive paper and 3D printed models of metal nanoparticle cubes, rhombic dodecahedra, and octahedra bound by the low-index lattice planes of the face-centered cubic crystal structure are included. Nanoparticle shape control provides an accessible introduction to materials chemistry topics for students at all levels.

Bio: Anne K. Bentley is the Dr Robert B. Pamplin Jr Associate Professor of Science at Lewis & Clark College, where she studies the chemistry of nanoscale materials and teaches general, inorganic, and nanomaterials chemistry. She studied as an undergraduate at Oberlin College, taught high school science in Namibia as a US Peace Corps volunteer, grew metal nanowires as a PhD student at the University of Wisconsin, and combined educational research with solar energy research as a postdoctoral fellow at Purdue University. Since joining the Lewis & Clark community in 2007, her research with students has focused on the electrodeposition of thin films for energy storage, understanding gold and silver nanoparticle surface chemistry, and most recently, nanoparticle shape control. Her research has been supported by the National Science Foundation (NSF), the Camille & Henry Dreyfus Foundation, and the W. M. Keck Foundation. Since 2014, she has served on the leadership team of the Interactive Online Community of Inorganic Chemists (IONiC), a national group supporting and studying the teaching of inorganic chemistry. Professor Bentley has recently been recognized with the American Chemical Society's Rising Star Award (2020), Lewis & Clark's Division of Student Life Partner Award (2021), and the Lorry Lokey Faculty Excellence Award (2022).