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Coherent Diffraction Imaging and Sample Characterization[1]
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We seek to use x-ray coherent diffraction imaging (CDI) to study how things break at the nanometer scale. Computer simulations using Fourier transforms and their inverse were used to simulate diffraction and highlight the importance of a priori information in retrieving the complex image of a sample. A physical sample of gold nanoparticle clusters on a sapphire substrate was then characterized using electron backscatter diffraction in order to identify interesting sites and retrieve surface level information. After applying stress by heating the sample to 700 degrees Celsius, the sites were imaged again and some evidence of annealing was present. Twin grain boundaries were identified as prime sites for CDI because their unique orientations allow for a support constraint of known values. The goal is to use the 3 dimensional reconstructive capabilities of CDI to analyze how a material's atomic lattice surrounding these boundaries or other defects shifts when stress is applied.

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