

Project description:

Transmission Kikuchi diffraction characterization of Cu nanoparticles in the SEM

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Transmission Kikuchi diffraction (TKD) is a diffraction technique applied to quantitatively characterize the microstructure of crystalline, electron transparent, samples in the scanning electron microscope (SEM). It was first proposed in 2012 by Keller and Geiss [1] and it has attracted attention of scientists from a variety of fields. Recently we have been able to investigate individual nanoparticles using TKD and correlate their individual microstructure with their hydrogen absorption and desorption properties[2]. The work has resulted in a fundamental understanding of the role of grain boundaries in the hydrogen-induced phase transition during hydride formation and decomposition.

The goal of the current project is to correlate the microstructure of Cu nanoparticles with their oxidation and reduction properties. To that end, transmission Kikuchi diffraction will be used to map the microstructure of individual particles. Since the diffraction signal is strongly related to the material density and thickness, a detailed parameter study will be necessary to obtain the desired characterization.

- [1] R. r Keller and R. h Geiss, "Transmission EBSD from 10 nm domains in a scanning electron microscope," *J. Microsc.*, vol. 245, no. 3, pp. 245–251, Mar. 2012.
- [2] S. Alekseeva, A. B. da S. Fanta, B. landolo, T. J. Antosiewicz, F. A. A. Nugroho, J. B. Wagner, A. Burrows, V. P. Zhdanov, and C. Langhammer, "Grain boundary mediated hydriding phase transformations in individual polycrystalline metal nanoparticles," *Nat. Commun.*, vol. 8, no. 1, p. 1084, Dec. 2017.