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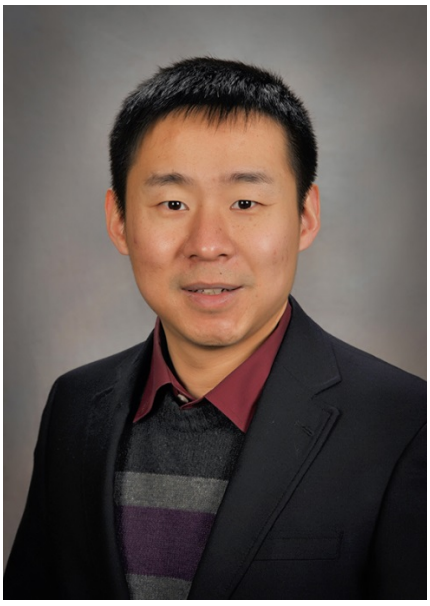
TEM-based orientation and strain mapping – A new nano-scale characterization capability to be available at MCF

Orientation and strain information are critical to the mechanical properties and functionalities of crystalline materials. Electron backscattered diffraction (EBSD) has been the most-widely used characterization technique to reveal such information. However, EBSD suffers from limited spatial resolution due to the electron beam-sample interaction. At MCF, we are in the process of installing a new precession electron diffraction (PED) system, which can offer direct experimental evidence of orientation and strain in a materials at 10x improved spatial resolution compared to EBSD. The crystal orientation is obtained by matching the experimental diffraction results with the ones in the database. Strain information is extracted by comparing the experimentally measured strain to the strain-free counterpart in the reciprocal space. In this presentation, boron carbide is used as a model material to elucidate the working mechanisms of the system. Additional information such as reliability mapping and cross-correlation mapping will also be discussed.



Dr. Kelvin Xie's research focuses on understanding and designing materials at nano- and atomic-scales using advanced microstructural characterizations (e.g. TEM and atom probe tomography). Kelvin is currently an Assistant Professor at Department of Materials Science and Engineering at Texas A&M University. Before this appointment, he was working as a Postdoctoral Research Fellow and then an Assistant Research Scientist with Prof. Kevin Hemker at Johns Hopkins University. He obtained his Ph.D. in 2013 at the Department of Mechanical Engineering and Australian Centre for Microscopy and Microanalysis under the supervision of Profs. Julie Cairney and Simon Ringer.