

# Kinoform Lenses for Focusing X-rays at Energies Greater than 50 keV

Kenneth Evans-Luterodt\*<sup>1</sup>, Sarvjit Shastri<sup>2</sup>, Yang Ren<sup>2</sup>, and Wenge Yang<sup>3</sup>

<sup>1</sup>*Brookhaven National Labs, USA*

<sup>2</sup>*Argonne National Labs, USA*

<sup>3</sup>*Center for High Pressure Science and Technology Advanced Research, China*

\**kenne@bnl.gov*

Studying materials with high energy (  $> 50$  keV ) X-ray photons brings some advantages for materials characterization. For example, the pair distribution function method (PDF) gets better real space resolution with higher energy photons. The ability to focus X-ray beams of high energy photons brings further experimental benefits for materials characterization, including greater flux on small samples, improved signal to background, and also enabling spatial scanning of samples.

In this talk, we present our recent results using silicon kinoform lenses to focus X-ray photons with energies as low as 52keV and as high as 107 keV, measured on beamlines 1-ID and 11-ID-C at the Advanced Photon Source. In a number of experiments, we have created micron and sub-micron beams, in some cases as small as 225 nm. Latest improvements in lens fabrication will also be presented. We will also show a numerical comparison between refractive lenses made from different materials such as Beryllium, Silicon and Diamond and kinofom lenses made from Silicon and Diamond, and discuss the relative merits for these high photon energies.