A High-Energy X-ray Microscope for APS-U

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Abstract

We propose construction of a high-energy x-ray microscope (HEXM) on a long beamline, which will provide unprecedented capabilities to investigate structure and its evolution within bulk materials. Current high-energy x-ray techniques will be refined, and combined with MBA-enabled coherence techniques, to provide multi-modal imaging spanning millimeters to angstroms in single experiments. HEXM requires the source characteristics unique to the MBA-upgraded APS - increased coherence and brilliance at high-energies (35–120 keV) - in order provide non-destructive measurements at the highest spatial and temporal resolutions. New capabilities will benefit a wide suite of materials classes. An end-station external to the APS building will enhance the ability to study extreme material states, including *in situ* ion-irradiation and additive manufacturing. The coupling of this multi-scale information with modelling efforts promises to revolutionize our ability to accelerate material development.