DEVELOPMENTS IN HIGH-ENERGY X-RAY OPTICS AT ADVANCED PHOTON SOURCE BEAMLINE 1-ID

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Recent third-generation synchrotron sources based on storage rings operating at high beam energies (6-8 GeV) produce intense radiation in the form of high-energy x-rays (> 50 keV) that are well-suited to specific applications in materials and physics research. Development of efficient optics for x-rays of short wavelengths under 0.25 A becomes a necessity. In view of this, four high-energy optics developments accomplished at the SRI-CAT 1-ID beamline are presented. The first is a cryogenically cooled, bent double-Laue monochromator for 50-200 keV x-rays that delivers over ten times more flux than does a flat crystal monochromator, but without an increase in energy width. Second, auxiliary optics using compound refractive lenses and dispersive channel-cut crystals to achieve high-energy resolution is explained. Third, the microfocusing of 50 keV undulator radiation using two stacked Fresnel zone plates is described. Fourth, a high-resolution inverse-Cauchois scanning analyzer, consisting of a bent Laue crystal, is presented for Compton and fluorescence spectroscopy applications.

This work was supported by the U.S. Department of Energy, Office of Science, Basic Energy Sciences, under Contract No. W-31-109-Eng-38.