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2.32 Polarization-splitting crystals for 2–30 keV spectral lines

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Certain crystal types have internal planes oriented such that they can be used as polarizing beam splitters at specific x-ray energies. Such a crystal can be used, for example, to measure the polarization of the spectral lines emitted by high-temperature plasmas. Generally, the polarization is caused by plasma anisotropy, and measuring it can provide insight into the mechanism that creates the anisotropy. Polarization measurements are possible using crystal planes with lattice spacing such that d$\sqrt{2}$ is close to the line wavelength, which ensures that the Bragg angle is in the vicinity of the perfectly polarizing 45°. The results of a systematic search for pairs of crystal planes and spectral lines that satisfy this polarization-splitting condition will be presented. The goal is to develop an instrument to measure and record simultaneous S and P polarizations of emitted x-rays in the 2–30 keV spectrum. This work was done by National Security Technologies, LLC, under Contract No. DE-AC52-06NA25946, by Mission Support and Test Services, LLC, under Contract No. DE-NA0003624, and by Sandia National Laboratories under contract DE-NA-0003525 with the U.S. Department of Energy, and supported by the Site-Directed Research and Development Program. DOE/NV/03624--0021

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