NEW HIGH-PERFORMANCE DEVICE FOR PARALLEL-BEAM X-RAY DIFFRACTOMETER SCAN

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Diffractometers with the Bragg-Brentano para-focusing geometry have been widely used in laboratory diffraction analysis of polycrystalline bulk and thin-film materials. Recently diffractometers using a parallel-beam geometry become increasingly popular for synchrotron radiation and laboratory X-ray experiments. Both para-focusing and parallel-beam geometries have advantages and disadvantages. The para-focusing geometry can achieve high intensities and high-angular resolution, while it suffers optical aberrations arising from various causes such as of flat specimen, specimen absorption, specimen position variation, θ–2θ decoupling, etc. On the other hand, the parallel-beam geometry is free from specimen-position dependent aberrations. It can achieve high angular resolution and low background intensities when a perfect crystal analyzer is used on the diffracted beam side. However, the diffracted intensities are generally sacrificed, as a trade-off for high resolution.

In the present study, a high-performance diffracted-beam analyzer consisting of perfect crystals is proposed as a simple and compact device for increasing the diffracted intensities by one order of magnitude compared to that of a single crystal analyzer. It has been widely believed that an analyzer for obtaining high angular resolution cannot be placed in front of a multi-dimensional detector. In the present study, results on a new application of this new analyzer together with a one-dimensional silicon strip detector will be presented.