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The APS optics topography station

Szczesny (Felix) Krasnicki

Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439

An in-house station for topographic testing of x-ray optics elements for the Advanced Photon Source experimental beamlines was set up by the Experimental Facilities Division of Argonne National Laboratory. A new double-crystal x-ray diffractometer was designed and built keeping in mind needs for testing large crystals (up to 300 mm x 90 mm of front face) possibly attached to cooling manifolds and lines. The diffractometer is installed in a separate enclosure at a distance of about 2 m from the source (18 kW rotating Cu or Mo anode). The primary beam is transported in a vacuum tube. Depending on the experimental requirement, the whole diffractometer or only the monochromator table may be translated automatically in the direction normal to the primary beam. Also, the collimator between the crystals and the detector of the beam reflected from the second (sample) crystal can be automatically translated normally to the corresponding beams. The arm linking both crystal tables can be manually positioned at angles up to 116 degrees with respect to the primary beam. Topograms are recorded on a photographic material placed in the beam reflected from the second crystal. By using highly asymmetrically cut monochromators, the useful footprint of the monochromatic beam is about 90 mm x 80 mm. This allows testing of many crystals without the need to use the monochromator translation. The work of ten stepping motors and the rocking curve measurements are automated and controlled by a computer. So far, many silicon and some diamond crystals have been tested. Some examples of results will be demonstrated.

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