Grazing Incidence Diffraction with Single Crystal Diffractometer

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New designs of the microfocus x-ray sources, x-ray optics and 2D detectors helped to advance the state-of-the-art single crystal (SC) diffractometers so they can be successfully used not only for small molecule absolute crystal structure determination but also for the protein crystallography. The x-ray flux densities of the new microfocus sources combined with advanced x-ray optics now reach 25-35 x 10^9 ph/(s·mm^2) which rival those employing 4kW rotating anode x-ray sources. These new sources and detectors can be successfully used for thin film microstructural analysis in a reflection mode.

I will describe how single crystal diffractometer equipped with kappa goniometer can be utilized for Grazing Incidence Diffraction (GID). The GID geometry combined with the high flux of the microfocus sources and 2D detectors facilitate identification and evaluation the crystalline phases, texture and residual stress in the layers that are as thin as few nm. The advantages and limitations of the GID setup for kappa-equipped SC diffractometers will be discussed.

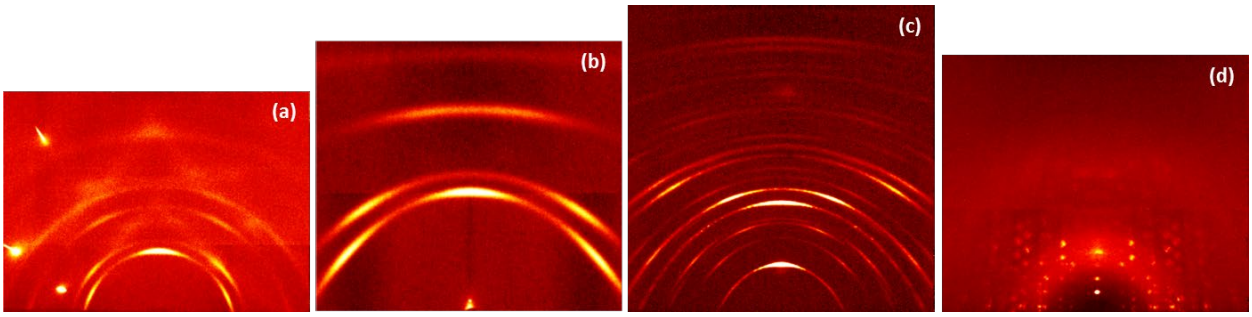

Figure 1. GID data: textured metallic film on Si wafer (a) Mo-source and (b) Cu-source; (c) textured $CH_3NH_3PbI_3$ perovskite thin film; (d) strongly textured perovskite-type thin film.