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Single beam approach for GISAXS[1] BYEONGDU LEE, CHIEH-TSUNG LO, Argonne National Laboratory, PAPPANNAN THIYAGARAJAN, ZHONGWEI NIU, QIAN WANG, University of South Carolina — The multiple scattering effects present in the grazing incidence small-angle x-ray scattering (GISAXS) data are addressed theoretically as well as experimentally with measurement of a series of patterns at different incident angles, referred to as "incident-angle-resolved GISAXS" (IAR-GISAXS). We found that under certain conditions, it is possible to extract the correct structural features of the materials from the GISAXS data using the kinematic SAXS formalisms assuming a single beam, without the need to use the distorted wave Born approximation (DWBA) to account for the scattering by the reflected beam. Furthermore, the Kiessig fringes in GISAXS enable the measurement of average distance between the particle and the substrate, similar to the measurement of film thickness using the fringes in the x-ray reflectivity data. We believe that the methods developed here will expand the application of GISAXS as they enable the use of model-independent and kinematic SAXS theories to nanostructured 2D-ordered films.

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