

272f On the Interpretation of Artifacts in 2d Gisaxs Patterns of Nanostructured Films

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2D Grazing-angle of incidence small-angle x-ray scattering (GISAXS) is rapidly becoming a key characterization method for nanostructured thin films due to the fact that it can probe the structural features of the film both parallel and perpendicular to the substrate. From this data the symmetry, degree of long-range order, orientation with respect to the substrate, wall thickness, electron density contrast, and film thickness can all be obtained from data. In addition, the x-ray data is collected over macroscopic regions of the sample, and thus the data truly reflect the dominant structure film, as opposed to TEM images. However, in this scattering geometry, there are several artifacts that may appear and hinder data interpretation. Additionally, for nanostructured films, the diffracted beams may occur at very low angles, which introduces additional artifacts. These artifacts may be incorrectly labeled as a Bragg peak and can thus result in incorrect conclusions about the structure. Here, we will present calculations that predict the artifacts and show examples from experimental data. Four major artifacts that arise in 2D GISAXS data are presented here. They are specular reflection of the incident beam off the air/film and film/substrate interfaces, reflection of diffracted Bragg peaks off the film/substrate interface, and diffraction from the reflected incident beam at the film/substrate interface. Additionally, refraction events from low-angle transmission experiments are discussed along with the effects of adsorption when comparing low-angle transmission and transmission data.