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Off-Specular Neutron and X-ray Reflectometry for the Structural Characterization of Buried Interfaces KRISTOPHER LAVERY, VIVEK PRABHU, ERIC LIN, WEN-LI WU, NIST Polymers Division, KWANG-WOO CHOI, Intel Corporation, SUSHIL SATIJA, NIST Center for Neutron Research, MATTHEW WORMINGTON, Bede X-ray Metrology — For applications in semiconductor processing and nanotechnology, the lateral structure of interfaces can significantly affect the performance of a given device. For example, roughness on the edges of developed photoresist patterns can reduce the performance of the final devices. Off-specular reflectometry is a non-destructive scattering technique sensitive to lateral compositional variations at surfaces and interfaces. It is particularly well-suited as a means of measuring the form and amplitude of surface roughness, as well as separating contributions from physical roughness and gradients in material density. In this work, model rough surfaces were prepared on float glass substrates and the roughness and lateral correlation lengths were cross-correlated using neutron and x-ray off-specular reflectometry measurements. These techniques were extended to observe the lateral correlation length of the reaction-diffusion front in a model photoresist using a polymer-polymer bilayer designed to mimic an ideal lithographic line edge. These experiments highlight the advantages of the technique for the investigation of buried interfaces while illustrating how x-ray and neutron techniques work complementarily to measure interfacial roughness.

Kristopher Lavery
NIST Polymers Division

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