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Determining Thin Film Roughness with Extreme Ultraviolet Light CODY PETRIE, STEPHEN HARMAN, STEVEN TURLEY, Brigham Young University — Understanding surface roughness is essential in ultraviolet (EUV) optics. The wavelength of EUV light is shorter than that of ultraviolet light, and as a result is more sensitive to surface roughness. At the shortest EUV wavelengths, the reflection and transmission are so sensitive to roughness that atomic force microscopy (AFM), and electron microscopy techniques are not sufficiently accurate to predict the effects roughness on the optical properties of thin-film mirrors. We have sputtered two single-layer uranium oxide films of thicknesses 44 $\pm$ 3nm and 408 $\pm$ 10nm to demonstrate an optical techniques for accurately determining surface properties of these films. We measured non-specular reflectance from these surfaces over several decades of intensity and compared these to calculations of scattering from rough surfaces. These measurements were consistent with AFM measurements of surface height, but had detail beyond what could be determined from AFM measurements alone.

Stephen Harman
Brigham Young University

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