X-ray Reflectivity and Power Spectral Density of Smoothly Polished Silicon\textsuperscript{1} LAHSEN ASSOUFID, ALBERT MACRANDER, SURESH NARAYANAN, RUBEN KHACHATRYAN, Argonne, SUNIL SINHA, UCSD — Silicon polished by means of chemical-mechanical-polishing has been studied. A finely crevaced top surface was seen in the AFM data. The power-spectral-density was measured by means of interferometry and by atomic force microscopy, and a roughness value of 0.21-0.23 nm rms was found by integration. X-ray reflectivity data for 10 keV x-rays were obtained at the Advanced Photon Source, and a roughness of 0.22 - 0.30 nm was found to be roughly consistent with these data. A surface layer with a slightly higher density than that of crystalline silicon was needed to model the x-ray reflectivity. Crevaces 3.6 nm deep and resulting in land areas having 85\% coverage were invoked for the modeling. A total layer thickness of 7.4 nm was invoked for the modeling. That is, the crevaces penetrated roughly half way through the total layer thickness. Due to the overall agreement between the two very different techniques for measuring roughness, namely, PSD and x-ray reflectivity data, we consider these results to accurately quantify roughnesses for a silicon surface that is near the state-of-art for smoothness.

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