Nanostructures studied by AFM and EUV scatterometry

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Ion bombardment (IB) may polish or roughen surfaces. During roughening surfaces, the IB-induced nanostructures can be spontaneously and masklessly formed. The periodicity of nanostructures produced by IB is unique, which is between that of random structures and periodic gratings. Hence, these IB-induced nanostructures arouse both academic and technical interests.

In this contribution, the morphology of four typical samples with tailored roughness and orderliness is investigated by atomic force microscopy (AFM) (Fig. 1) and extreme ultraviolet angle-resolved scattering (EUV ARS) (Fig. 2). The morphological data of each sample, characterized by AFM and EUV ARS, agree well [1]. Moreover, typical modeling approaches including the Generalized Harvey-Shack theory and Rigorous Coupled Wave Analysis will be presented for the comparison between experiments and theoretical simulation. This work may provide insight into the topography and scattering of quasi-periodic nanostructures.

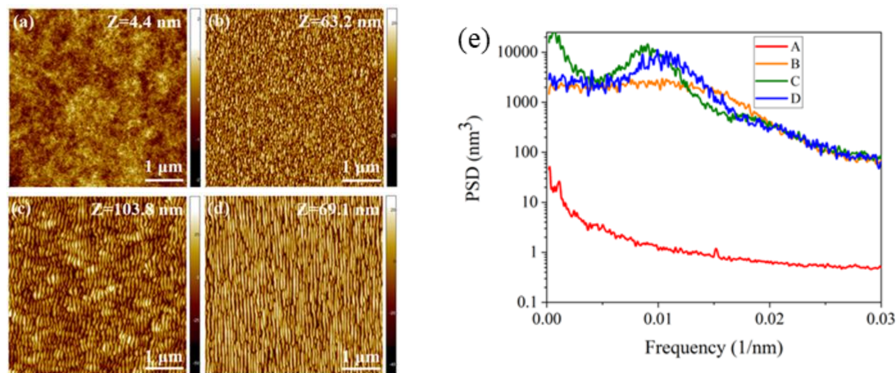

Fig. 1 (a–d) AFM results of samples A–D. The roughnesses of the four samples are 0.4 nm, 8.8 nm, 14.2 nm and 11.2 nm. (e) Power Spectral Density curves of samples A–D in (a–d).

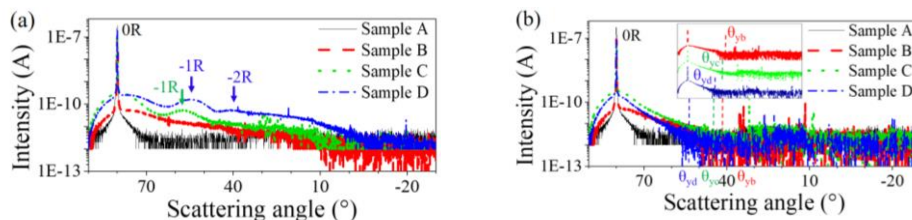

Fig. 2 Measured EUV scattering results of samples A–D, (a) in-plane mode, (b) conical mode.

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[1] J. Li, G. Yang, Z. Zang, H. Chen, T. Huo, H. Zhou, Y. Lu, Y. Liu, Y. Hong, and S. Fu, 2022, Acta Optica Sinica **43(19)**, 1936001.