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Broad-Area Surface Nano-Patterning by Ion Beam Sputtering[1]
EMMETT RANDEL, CARMEN MENONI, R. MARK BRADLEY, MATT P. HARRISON, Colorado State Univ — Self organized nano-patterning by low energy ion beam sputtering (IBS) is a promising technique for producing nanostructures. Uniform structures in a variety of materials can be patterned quickly over large areas. Nano-ripples were produced by sputtering Si (100) substrates with Ar^+ ions at near normal incidence during the co-deposition of Ta and Mo impurities. The Ta was introduced using a separate target and source, allowing for control of impurity flux and energy. The Mo was introduced by sputtering an Si substrate surrounded by Mo plate. It is shown that the orientation of ripples can be controlled with the impurity flux. The patterning of ripples and terraces in the absence of impurities was also explored. Si (100) substrates were sputtered at high angles of incidence by Ar^+, Kr^+, and Xe^+ ions. It is shown that short wavelength ripples appear early in the pattern formation, and over time the pattern coarsens, leading to long wavelength structures dominating. This work was performed in tandem with theory in an effort to refine models.

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Emmett Randel
Colorado State Univ

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