Contribution ID: **32** Type: **Poster**

Pattern transitions on Argon ion sculpted Silicon surfaces

The dynamic of self-organized nanopatterns on solid surfaces has been studied using low energy ion beam but it remains a central theme within ion beam sputtering still [1-4]. The previous work for dynamical characterization has been focused on ion sputtering using unconventional methods [2, 3].
We investigated morphology evolution of 500 eV Ar+ sputtered Si surfaces at an incidence of 67˚ using an unconventional method of substrate swinging by different azimuthal angles $\Delta\phi$ from 0 ˚ to 360 ˚ and speeds up to 16 rotations per minute (RPM) [7]. The samples displayed four different regimes when they were swung azimuthally by different angles at a speed of 1 RPM. Initially, a hierarchical structure (regime 1) comprised of ripples and triangles were obtained which gave way to only ripples (regime 2) at $\Delta\phi$ = 80 ˚. A narrow 3rd regime showed a completely flat surface at 100 ˚. Above this angle, only disordered ripples devoid of any triangles were obtained up to 360 ˚ (regime 4). This regime also demonstrated drastic changes in orientation of the ripple wave vector at certain angles of $\Delta\phi$. The wavelengths and roughnesses decreased with higher azimuthal angles. Our observations were found to be highly reproducible. Upon swinging the samples for $\Delta\phi$ = 70 ˚ at higher speeds resulted in disordered ripple structures with smoother surfaces. Ripples were found to be the most ordered for 1 RPM speed. In contrast to the above, samples rotated continuously for different durations, when compared with a static case, displayed isotropically roughened surfaces. 2D slope distributions of the morphologies demonstrated formation of asymmetric ripple structures on the surfaces.[6].Our results were explained in the light of linear and non-linear regimes of sputtering [4-5].The crucial role played by dispersive linear terms explained the formation of the hierarchical structures at small swing angles. Once the dispersive effects die down, the ripples change their orientation. The asymmetry in surface structures was explained by the near-surface mass transport phenomenon at oblique azimuthal angles. This study demonstrates for the first time the role of this unconventional technique to drive a system towards abrupt morphological transitions not observed otherwise.

Primary author: Ms RAKHI (Indian Institute of Technology Ropar, 140001, Punjab, India)

Co-author: Mr SARKAR, Subhendu (Indian Institute of Technology, Ropar, 140001, Punjab, India)

Presenter: Ms RAKHI (Indian Institute of Technology Ropar, 140001, Punjab, India)

Session Classification: Posters