DS 47: Ion Interactions with Nano Scale Materials II (Focused Session – Organisers: Diesing, Facsko)

Time: Thursday 14:45–15:45 Location: GER 37

Topical Talk DS 47.1 Thu 14:45 GER 37

Trails of kilovolt ions created by subsurface channeling — •Thomas Michely[1], Alex Redinger[1], Sebastian Standop[1], Yudi Rosandi[2], and Herbert Urbassek[2] — [1]II. Physikalisches Institut, Universität zu Köln, Germany — [2]Fachbereich Physik und Forschungszentrum OPTIMAS, Universität Kaiserslautern, Germany

Using scanning tunneling microscopy, we observe the damage trails produced by keV noble-gas ions incident at glancing angles onto Pt(111). Surface vacancies and adatoms aligned along the ion trajectory constitute ion trails. Atomistic simulations reveal that these straight trails are produced by nuclear (elastic) collisions with surface layer atoms during subsurface channeling of the projectiles. In a small energy window around 5 keV, Xe^+ ions create vacancy grooves that mark the ion trajectory with atomic precision. The asymmetry of the adatom production on the two sides of the projectile path is traced back to the asymmetry of the subsurface channel. For ripple pattern formation through grazing incidence ion bombardment trail formation is of decisive importance for the regularity and alignment of the resulting erosion morphology.

Topical Talk DS 47.2 Thu 15:15 GER 37

The impact of fast ions in pulsed laser deposition — •Michael Schmid — TU Wien, Institut für Angewandte Physik, Wien, Austria

Pulsed laser deposition (PLD) is a method for growing thin films that combines nonthermal particle energies (typically 30 to 300 eV) with ultrahigh-vacuum compatibility. This allows us to study the effects of energetic ions on growth of ultrathin films by high-resolution scanning tunneling microscopy [1]. Ions with energies above 100 eV can create adatoms or small adatom clusters by "failed sputtering", which increases the number of nucleation centers and, thus, the island density. Ion implantation in the surface is possible already at lower energies. In heteroepitaxy, ion implantation creates a chemically inhomogeneous surface, which modifies surface diffusion and again leads to an increased island density. High island densities, combined with facile implantation near steps, result in improved layer-by-layer growth. We propose that the same mechanisms are effective in sputter deposition.

[1] M. Schmid et al., Phys. Rev. Lett. 103, 076101 (2009).