

Kinetic effects on the morphological evolution of sputtered Pd(001)

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We have investigated the kinetic effects on the morphological evolution of an Ar-ion sputtered Pd(001) by in situ, real-time x-ray reflectivity and grazing-incidence small angle x-ray scattering measurements at various substrate temperatures. We find that surface roughness W and its associated growth exponent increase with T up to a certain temperature T_m . Beyond T_m , however, they decrease with increasing T . For $T < T_m$, surface roughening and coarsening kinetics are mostly driven by the deposition and diffusion of sputter-induced adatoms as reported in molecular beam epitaxial (MBE) growth. When T is near T_m , however, vacancies rather than adatoms become the dominant surface species. Above T_m , the surface smoothing via adatom detachment and vacancy diffusion across step edges becomes effective.