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Smoothening Mechanism for GaAs(100) Surfaces during Plasma Etching SANG LEE, HARRY GILLIS, CHRISTIAN RATSCH, UCLA — Scanning probe microscopy and modeling have advanced the understanding of surface morphology evolution during thermal processing (deposition) and ion bombardment (sputtering). Ion-enhanced plasma etching, where the morphology is determined by the interplay between chemical and ion effects, is less advanced. We have demonstrated the transition from crystallographic to smooth morphology as ion energy increases during etching of GaAs(100) with BCl_3-Cl_2 gases. With negligible ion energy, the surface develops <110> ridges and {111} facets, as expected from chemistry. With ions at *ca.* 27 eV, ridges and facets are reduced, and the surfaces become smooth (RMS roughness <0.5 nm) at ion energy above 100 eV. This transition was simulated using Kinetic Monte Carlo methods, in which morphology is correlated with the relative etch rates at specific types of lattice sites. The simulation results suggest that ion bombardment increases the etch rate at "ridge" sites relative to other sites, and enables smooth surface etching, primarily by step flow.

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