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Ion Beam Energy Dependant Study of Nanopore Sculpting BRAD LEDDEN, ERIC KRUEGER, JIALI LI, University of Arkansas — Experiments show that ion beams of various energies (1keV, 3keV, and 5keV) can be used to controllably "sculpt" nanoscale features in silicon nitride films using a feedback controlled ion beam sculpting apparatus. We report on nanopore ion beam sculpting effects that depend on inert gas ion beam energy. We show that: (1) all ion beam energies enable single nanometer control of structural dimensions in nanopores; (2) the ion beam energies above show similar ion beam flux dependence of nanopore formation; (3) the thickness of nanopores differs depending on ion beam energy. Computer simulations (with SRIM and TRIM) and an "adatom" surface diffusion model are employed to explain the dynamics of nanoscale dimension change by competing sputtering and surface mass transport processes induced by different ion beam irradiation. These experiments and theoretical work reveal the surface atomic transport phenomena in a quantitative way that allows the extraction of parameters such as the adatom surface diffusion coefficients and average travel distances.

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