

Surface nanopatterning of Si by ion beam irradiation with sub-sputter-threshold energy

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Abstract-

We examine the formation of nanoscale patterns on silicon surfaces subjected to ion beam irradiation at energies below the sputtering threshold, which suppresses net erosion. Using Kr ions with well-defined energies, we provide solid evidence that mass redistribution alone can lead to surface instability and the formation of patterns. The experimentally observed ripple structures are well described by continuum models that describe similar pattern formation processes on the surfaces of Aeolian sand dunes. This suggests that ion winds are responsible for redistributing surface atoms, forming the observed ripple patterns.

Index Terms- Growth processes, Irradiation effects, Nonequilibrium statistical mechanics, Chaos & nonlinear dynamics

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