

Order enhancement and coarsening of self-organized silicon nanodot patterns induced by ion-beam sputtering

R. Gago Fernández; L.F. Vázquez Burgos; O. Plantevin; T.H. Metzger; J. Muñoz García; R. Cuerno Rejado; M. Castro Ponce

Abstract-

The temporal evolution of the characteristic wavelength (λ) and ordering range (ξ) of self-organized nanodot patterns induced during Ar⁺ ion beam sputtering on Si(001) and Si(111) surfaces is studied by atomic force microscopy and grazing incidence x-ray diffraction. The patterns exhibit initial coarsening of λ (up to 54-60 nm) and increase in ξ (up to 400-500 nm) after which both features stabilize. The pattern formation is only weakly controlled by the crystallographic surface orientation, Si(111) surfaces showing a faster evolution into a proper stationary state. This trend is attributed to a higher sputtering rate at this orientation, as confirmed by theoretical simulations. (c) 2006 American Institute of Physics.

Index Terms- surfaces, erosion, dots

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