

Potential energy threshold for nano-hillock formation by impact of slow highly charged ions on a CaF₂(111) surface

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We investigate the formation of nano-sized hillocks on the (111) surface of CaF₂ single crystals by impact of slow highly charged ions. Atomic force microscopy reveals a surprisingly sharp and well-defined threshold of potential energy carried into the collision of about 14 keV for hillock formation. Estimates of the energy density deposited suggest that the threshold is linked to a solid-liquid phase transition ("melting") on the nanoscale. With increasing potential energy, both the basal diameter and the height of the hillocks increase. The present results reveal a remarkable similarity between the present predominantly potential energy driven process and track formation by the thermal spike of swift (~GeV) heavy ions.