Nanostructure dynamics of materials under quantum beams in MB-HVEM

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An energetic quantum beam irradiation on materials induces self-organized nanoscale structures due to its energy dissipative nature originating from setting up a non-equilibrium open system at a far-from equilibrium condition.We report the formation process of laser induced nanostructures on a silicon device by means of in-situ observation using laser (attached) high voltage electron microscope (L- HVEM), which has been newly developed at Hokkaido University.

Laser-induced dots and ripple structures developed on Si(100) surface were dynamically observed in-situ inside the L-HVEM. Thrusting of dots occurred with approximately 30nm high and 200nm inter-spaced and with a quasi-ordered alignments on a silicon surface by laser irradiation in such a muli-beam laser-HVEM. It was concluded that these ordered dots grow up to yield the ripple pattern and a conical structure due to a large energy deposition by laser irradiation, i.e., the intensity of incident laser or a number of laser pulses followed.