
HL 45: Invited Talk Liu

Time: Thursday 11:45–12:30

Location: HSZ 01

Invited Talk HL 45.1 Thu 11:45 HSZ 01
Strain Induced Growth Instability and Island Nucleation on Patterned Substrate — ●FENG LIU — University of Utah, Salt Lake City, USA

Strain induced self-assembly provides an attractive route to nanofabrication of semiconductor quantum dots on surfaces. Recent experiments have demonstrated that combining the strain induced self-assembly with surface patterning provides an effective method to further improve the size uniformity and spatial ordering of quantum dots. However, the underlying mechanisms responsible for such improvement remain poorly understood. In this talk, I will present theoretical analyses of strain induced growth instability and island nucleation on patterned

substrates. We show that the growth of a strained film is inherently less stable on a wavy substrate than on a flat substrate. For small surface undulation, the critical wavelength characterizing the initial instability on a wavy substrate is effectively half of that on a flat substrate. Furthermore, on patterned substrates, island nucleation is directed to the preferred sites by a much lower energy barrier and smaller critical size. Strain relaxation directs island nucleation to the bottom of a pit rather than the top of a ridge as commonly perceived, while large surface energy anisotropy leads to nucleation at both places. Our theory explains some puzzling experimental results and provides useful guidelines for future exploration of directing the self-assembly of quantum dots on patterned substrates.