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Temperature-induced Self-pinning and Nano-layering of AuSi Eutectic Droplets NICOLA FERRALIS, ROYA MABOUDIAN, CARLO CARRARO, University of California at Berkeley — A process for self-pinning of AuSi eutectic alloy droplets to a Si substrate, induced by a controlled temperature annealing in ultra-high vacuum, is presented. Surface pinning of AuSi 3D droplets to the Si substrate is found to be a consequence of the readjustment in the chemical composition of the droplets upon annealing, as required to maintain thermodynamic equilibrium at the solid-liquid interface. Structural and morphological changes leading to the pinning of the droplets to the substrate are analyzed using atomic force microscopy, scanning and transmission electron microscopy. Raman spectroscopy measurements performed on the droplets reveal phase separation upon cooling of the droplets, leading to the formation of amorphous Si-rich channels within the core, and the formation of crystalline Si nanoshells on the outside. The mechanism leading to the pinning and surface layering provide new insight into the role of alloying during growth of silicon nanowires and may be relevant to the engineering of nano-scale Si cavities. We shall also present measurements of the diffusion of Au drops on Si(111) obtained by low-energy electron microscopy.

Nicola Ferralis
University of California at Berkeley

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