PHYSICAL MATHEMATICS SEMINAR

DYNAMICS AND STABILITY OF METALLIC FOAMS: NETWORK MODELLING

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ABSTRACT:

High-porosity solids can be formed by directional solidification of a gas-liquid foam. However, molten metallic foams are thermodynamically unstable and coarsen rapidly making it difficult to preserve their structural integrity during freezing. We present a macroscale network model to study coarsening in planar (surfactant-free) metallic foams composed of polygonal gas bubbles separated by thin liquid films. In particular, we track the positions of the bubble vertices, where most of the liquid volume is concentrated, and incorporate a direct coupling between the pressure and volume of the bubbles, surface-tension forces on the gas-liquid interfaces and draining and elongational flows in the films. We invoke a van-der-Waals instability criterion and present numerical simulations of the large-scale topological re-arrangements as the foam disintegrates.

TUESDAY, MARCH 8, 2011
2:30 PM
Building 2, Room 105

Refreshments at 3:30 PM in Building 2, Room 290

Massachusetts Institute of Technology