Carnegie Mellon

Materials Science and Engineering Seminar Series:

Dr Dominique Chatain
Centre de Recherche en Matière Condensée et Nanosciences
CRMCN-CNRS

Composite Wetting of Metal on Micro-patterned Surfaces of SiO_2

Friday, October 21, 2005
11:00 A.M. Seminar in Hamerschlag Hall B131
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

The topic of this seminar is relevant to "superhydrophobicity" of lotus-leaf-like surfaces. Wetting, spreading and adhesion on "rough" surfaces where the liquid does not fully contact the solid have been investigated. Liquid Pb on microlithographically patterned surfaces of SiO_2 has been chosen as a model system. The roughness of the substrate consists of circular holes or posts, 30□m in diameter and height, distributed in a six-fold symmetric pattern on 50% of the substrate area. The actual area of solid/liquid interface and the length of the triple line of a finite quantity of liquid in contact with such substrates are easy to determine. We examine the shape of liquid bridges between two identical facing parallel substrates, as they form by contact between the drop and the top substrate, and when they are compressed or stretched. The experiments show that: (1) adhesion between the liquid and the substrates depends on the actual state of the interface at the microscopic scale, (2) wetting depends on the location of the triple line on the surface and on the local wetting at the microscopic scale, and (3) spreading depends on the connectivity of the solid/liquid interface. The results are discussed and interpreted using the Surface Evolver software.

Dominique Chatain received an Engineer's Degree in Metallurgy in 1979, and a Doctorate in Physics in 1983, both from the Institut Nationale Polytechnique de Grenoble. She remained in Grenoble as a CNRS researcher from 1983 to 1990, and later joined the CRMC2-CNRS laboratory (now CRMCN-CNRS) in Marseille where she has been since 1991. Her research has addressed problems of interface thermodynamics, including the energetics, chemistry, and structure of interfaces, with a focus on wetting phenomena. Her recent work includes studies of the equilibrium crystal shapes of pure and adsorbate-covered metals, liquid metal penetration of grain boundaries; wetting transitions in liquid alloys and the effects thereon of micro-gravity environments; the stability of two-phase inclusions embedded in a third phase; and wetting of quasi-crystalline surfaces.