Center for Molecular and Engineering Thermodynamics

CMET Seminar:

University of Delaware

- Thursday, July 24, 2008
- 10:30 A.M. (refreshments available at 10:15 a.m.)
- 366 Colburn Laboratory

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"Archimedean-like Tilings on Decagonal Quasicrystalline Surfaces"

Monolayers on crystalline surfaces often form complex structures having physical and chemical properties strongly differing from those of their bulk phases. Such hetero-epitactic overlayers are currently used in nanotechnology, and understanding their growth mechanism is important for the development of novel materials and devices. Compared to crystals, quasicrystalline surfaces exhibit much larger structural and chemical complexity leading e.g. to unusual frictional, catalytical or optical properties. Accordingly, deposition of thin films onto such substrates can lead to novel structures which may even exhibit typical quasicrystalline properties. Recent experiments indeed demonstrate 5-fold symmetries in the diffraction pattern of metallic layers adsorbed onto quasicrystals. Here we report a real-space investigation of the phase behaviour of a colloidal monolayer interacting with a quasicrystalline decagonal substrate created by interfering five laser beams. We observe a novel pseudomorphic phase which exhibits likewise crystalline and quasicrystalline structural properties. It can be described by an Archimedean-like tiling consisting of alternating rows of square and triangular tiles. The calculated diffraction pattern of this phase is in agreement with recent observations of copper adsorbed on icosahedral AlPdMn surfaces. In addition to establishing a link between Archimedean tilings and quasicrystals, our experiments allow to investigate in real space how single-element monolayers can form commensurate structures on quasicrystalline surfaces.

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