Announcing the Final Examination of Wenlang Liang for the degree of Master of Science

Time & Location: November 1, 2011 at 2:00 PM in Materials Characterization Facility (MCF) 304
Title: Imaging long-range orientational order in monolayers of amphiphilic molecules with scanning probe force microscope and liquid crystal optical amplification

Monolayers of amphiphilic molecules at interface provide a unique system for understanding the thermodynamic and rheological properties of quasi two-dimensional systems. They are also an excellent model accessible for studying cell membranes. The feature of long-range organization of molecular tilt azimuth in monolayers at the air/water interface is one of the most interesting findings over the past two decades, which leads to the formation rich and defined textures. By observing the changes in these textures, the transitions between tilted monolayer phases can be detected. We study the boojum and stripe textures formed in the liquid-condensed phase of pentadecanoic acid (PDA) monolayers at the air/water interface and find that they can be preserved after being transferred to glass substrates at low dipping speeds at a temperature lower than the room temperature. Frictional force microscopy confirms the long-range tilt order in the transferred boojums and stripes of PDA, implying the interaction of the PDA molecules with the glass surface does not change the tilt order. Polymerized stripe textures of pentacosadiynoic acid (PCA) monolayers can also be transferred onto solid substrates. Atomic force microscopy shows that the PCA stripe textures represent the regular variations of molecular packing densities in PCA monolayers. Furthermore, we find that the molecular orientation and packing density changes in monolayers can induce the local order of nematic liquid crystals. Due to the long-range orientation correlation of nematic liquid crystals, the boojum and stripe textures in monolayers can be observed by an optical microscope after liquid crystal optical amplification.

Major: Materials Science and Engineering

Educational Career:
Bachelor's of Materials Processing and Control, BS, 2008, Huazhong University of Science and Technology

Committee in Charge:
Jiyu Fang, Chair, Mechanical, Materials AND Aerospace Engineering
Weiwei Deng, Mechanical, Materials AND Aerospace Engineering
Qun Huo, Nanoscience Technology Center & Department of Chemistry
Linan An, Mechanical, Materials AND Aerospace Engineering

Approved for distribution by Jiyu Fang, Committee Chair, on April 10, 2011.

The public is welcome to attend.