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Departmental Seminar

Evidence for roughness driven depinning of self-assembled liquid droplets

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Date: 11.08.2017 **Time**: 02:30 pm
Venue: Seminar Hall (GF), Department of Physics, CUTN.

Abstract

Self-assembly is the process by which an organized structure forms spontaneously from individual components, as a result of specific, local interactions among the components [1]. Self-assembling processes are common throughout nature and technology. They involve components from the molecular to the planetary scale and many different kinds of interactions [2]. The concept of self-assembly is used increasingly in many disciplines, with a different flavour and emphasis in each [3]. My talk will emphasise on self-assembly of condensed liquid droplets on a polymer solution [4]. Self-assembly of droplets deposited on a polymer solution of PDMS over a constrained surface and the effect of the constraint on the pinning of the droplets with respect to surface tension of the droplet forming liquid is studied experimentally. The nucleation, growth and evaporation of water, methanol and ethanol droplets on PDMS surface and thus patterns formed are analysed. Results are compared with similar experiments carried out on smooth surfaces. Surface morphology of the patterned surfaces are carried out using Confocal Laser Scanning microscope. Analysis of pore formation reflects the difference in patterns formed on constrained surface and smooth surface. The constrained surface showed a distorted hexagonal ring inside which closely arranged pores of smaller diameter are formed; whereas the smooth surface showed the ideal honey comb pattern. In both cases, the pore dimension and the diameter/shape of ring formed depends on the surface tension of the liquid [5,6]. Although ethanol and methanol have nearly same surface tension, the self-assembled droplet patterns formed by them show considerable differences in shape and size. The wetting studies are carried out using the contact angle goniometer with distilled water as reference liquid. All the surfaces showed hydrophobicity with high adhesiveness to water and a Wenzel's state of wetting.

References:

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