Confinement-induced stable liquid phases mimicking the behavior of lipid bilayers

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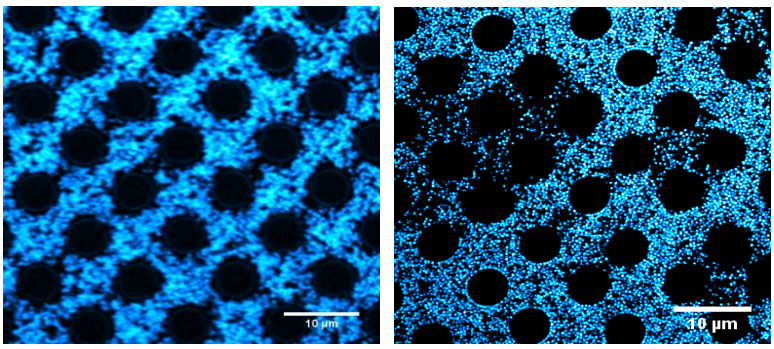
Model colloid-polymer mixtures have been extensively studied since the decade of 1990s. It has been shown that the presence of random polymer coils induces an effective attraction between colloidal particles, commonly referred to as depletion forces[1]. This attraction interaction leads the system to undergo phase separation under appropriate conditions of concentration and polymer-to-colloid size ratio. We study dense assemblies of 410nm PMMA spheres and monitor their phase behavior and dynamics combining confocal microscopy and direct observation. Having characterized the system in bulk, we observe its phase separation in confined environments of high complexity, such as periodically or randomly distributed immobile obstacles (quenched disorder). We compare our results with theoretical predictions[2].

[1] Ilett, S. M., Orrock, A., Poon, W. C. K., & Pusey, P. N., Phase behavior of a model colloid-polymer mixture. Physical Review E **51**, 1344 (1995)

[2] Fischer T.; Vink R.L.C.; Domain formation in membranes with quenched protein obstacles: Lateral heterogeneity and the connection to universality classes; *J.Chem.Phys. (*2011), *134*, 055106



A **B**

Figure: Cylindrical obstacles, diameter 5µm, average center-to-center distance 9µm were prepared by two-photon lithography. A concentrated colloid-polymer mixture of PMMA particles and polystyrene (M_w= 15MDa, R_g=108nm) is added to a substrate with the obstacles arranged periodically (**A)** or randomly (**B**).