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Ordering of a Langmuir monolayer of nanospheres

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Introduction: A Langmuir monolayer of nanospheres (i.e. a monolayer of nanospheres on the surface of water) would provide us with an ideal model to study some fundamental properties in two-dimension. In addition, formation of well-ordered monolayers of nanospheres on the surface of water would be an alternative method in fabrication of two-dimensional arrays of quantum dots [1].

Methods and Materials: Dodecanethiol-ligated gold nanospheres of 7nm in Hexan are spread on the surface of water in a Langmuir trough. X-ray surface specular reflectivity, grazing incidence diffraction and surface diffuse scattering were used to characterize the Langmuir film.

Results: Preliminary data analysis of x-ray reflectivity shows that the thickness of the Langmuir film of the nanospheres is equal to the diameter of the spheres, indicating that the nanospheres formed a monolayer on the surface of water. The diffraction data, with diffraction peaks up to the third order, indicated that the spheres formed close packed crystallines.

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References:

[1] Raghuvveer Parthasarathy, Xiao-Min Lin, and Heinrich M. Jaeger, "Electronic Transport in Metal Nanocrystal Arrays: The Effect of Structural Disorder on Scaling Behavior", *Phys. Rev. Lett.*, **87**, 186807 (2001).