

Lecture Series on Surface Forces 9

Organized by Institute of Multidisciplinary Research for
Advanced Materials (IMRAM) Tohoku University, CREST-JST



Time & Date: Oct. 6, 2009 (Thursday), 16:00-17:00

Venue: Main Conference Room (1F), No.1 Building of Laboratories for
Advanced Materials Research, Katahira, Tohoku University

Prof. M. P. Pileni (Université P et M Curie , France)

**“Nanocrystals organized in 2D superlattices :
A new class of materials”**

In this presentation it will be demonstrated for the first time that the control of the distance between nanocrystals ordered in 2D hexagonal network is induced by a water adsorption at the Au nanocrystal surface. A competition between water adsorption at the metallic hydrophilic surface and the chemisorption of the coating agent takes place. These adsorbed water molecules lead to additional attractive adhesion forces which decreases the inter-nanocrystal distance whereas the strong coating agent- metallic surface bonding maintain the 2D long-range ordering of the nanocrystals.

By using Reactive Ion Etching process it is discovered that new intrinsic properties as immunities regarding etching process or oxidation of highly self-ordered nanocrystals provided by the ordering. Furthermore, substrates are engraved to rich 3 nm in distance between objects as the best resolution.

The origin of the magnetic anisotropy is explained in an assembly of aligned magnetic nanoparticles. For that, nanoparticles synthesized biologically by *Magnetospirillum magneticum* AMB-1 magnetotactic bacteria are used. For the first time, it is possible to differentiate between the two contributions arising from the alignment of the magnetosome easy axes and the strength of the magnetosome dipolar interactions. The magnetic anisotropy is shown to arise mainly from the dipolar interactions between the magnetosomes.

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