

Liquid crystalline phases by metal nanoparticles

Ewa Gorecka

Department of Chemistry, Warsaw University, Zwirki i Wigury 101, 02-089 Warsaw, Poland

There is growing interest in fabrication of complex structures made of metal nanoparticles (NPs), as these materials might have some unusual properties, e.g. negative refractive index or plasmon waveguiding, etc. There are number of attempts to produce such structures by 'chemical' approach in which metal nanoparticles are grafted with appropriate organic molecules. At first glance this strategy is very attractive, in reality in most cases only amorphous aggregates and occasionally crystals with packing typical for hard spheres are obtained. It seems that more complex structures can be achieved if as organic coating, molecules with strong tendency for self-assembling *i.e.* liquid crystals, are used.

Overview of current results related to liquid crystalline nanoparticles will be presented.

I will show that the properly functionalized gold clusters can produce liquid crystalline phases with different degree of positional order [1]. Small (2nm diameter) gold clusters functionalized by mesogenic molecules can exhibit smectic or columnar phases upon slight changes in the molecular structure of graphing layer. The smectic and columnar phases were confirmed by x-ray studies. In the x-ray pattern of smectic phase series of sharp Bragg reflections was observed coming from lamellar structure with high electron density contrast and diffused signal from inlayer structure showing that gold nanoparticles have liquid-like order inside the layers. Both interlayer and inlayer periodicities are nearly temperature independent. The smectic and columnar structures reversibly melt into isotropic liquid.

1. M. Wojcik, W. Lewandowski, J. Matraszek, J. Mieczkowski, J. Borysiuk, D. Pocięcha, E. Gorecka, *Angewandte Chemie International Edition Jun 2009 DOI: 10.1002/anie.200901206*