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Self-organization of shape anisotropic nanoparticles at the liquid-air interface

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Self-organization of inorganic nanoparticles at liquid/air interfaces is a promising approach towards fabrication of novel functional 2D materials [1]. For spherical nanoparticles, the formation of two-dimensional superlattices was reported [2,3], whereas for shape anisotropic nanoparticles the detailed mechanism of nanoparticle organization at liquid/air interfaces requires further insight. In-situ monitoring of the particle arrangement at the liquid/air interface during compression is a promising approach towards the lateral packing as well as the vertical orientation and contact angle.

For our study of the shape-dependent nanoparticle self-organization at the liquid/air interface, we have synthesized monodisperse spherical and cubic maghemite nanoparticles and determined their particle size, shape and chemical composition. The samples were spread onto a H_2*emphasized text*O/D_2O subphase using a Langmuir set-up, which enables tuning the mean interparticle distance by variable surface compression. Structural information on the self-organization process was obtained from neutron reflectometry (NR) measurements, carried out at REFSANS (MLZ), leading to enhanced understanding of the nanoparticle self-organization at different compression points.

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