Mapping diffusion and sedimentation in model colloids with tailored shapes

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Building on previous work [1], we present a comprehensive study of the diffusion and sedimentation of clusters of spherical nanoparticles. Cluster preparation is accomplished by assembling polystyrene particles on evaporating emulsion droplets [2]. This results in supracolloids that exhibit well defined configurations that are governed by their number of constituent particles. Sorting into uniform cluster fractions is achieved through centrifugation of the cluster mixture in a density gradient.

The rotational and translational diffusion of the clusters is investigated by polarized and depolarized dynamic light scattering. Sedimentation coefficients are elucidated by differential centrifugal sedimentation. The experimental results are compared to data obtained via a hydrodynamic bead-shell model suitable to describe diffusion and sedimentation of particles with arbitrary shapes [3]. The experimental data is in excellent agreement with predictions from hydrodynamic modelling.

The diffusion and sedimentation of particles with defined anisotropic shapes play an important role in assembling 3D colloidal crystals, paving the way for improved photonic materials. The variety of investigated shapes shows the robustness of our approach and provides a complete picture of the hydrodynamic behavior of complex particles.

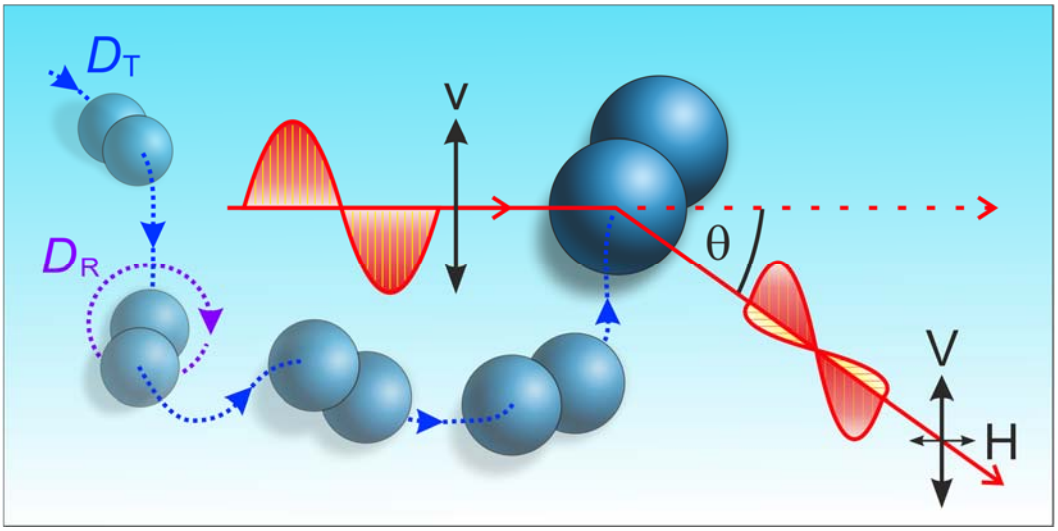

Figure 1. Mapping the diffusion of a dimer cluster by depolarized dynamic light scattering.

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[2] CS Wagner, A Wittemann, *Macromol. Rapid Commun.* **34** (2013), 1798.
[3] J García de la Torre, G del Rio Echenique, A Ortega, *J. Phys. Chem.* **111** (2007), 955.

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