PHOTO-INDUCED MOTION OF SPHERICAL BRUSHES

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For manipulating nano- and micro sized objects at interfaces there is no immediate concept to move an ensemble of objects in a controlled way within a selected, possibly very small area. Recently we have introduced a method of particle manipulation at liquid/solid interface by using light as external stimuli [1]. The mechanism of particle relocation is based on light induced generation of diffusioosmotic flow in the solution containing photosensitive molecules. These molecules are cationic surfactant, in hydrophobic tail of which azobenzene group is incorporated to. Under illumination the photosensitive surfactant photo-isomerizes from *trans*- to *cis*- state resulting in changing of the hydrophobicity of the whole molecule [2]. By local illumination with light of appropriate wavelength, the particles trapped at the solid interface can be collected or removed at the desired area of choice [1].

Here we report on light induced manipulation and active motion of particles decorated by polymer brushes. The driving force of motion is a reversible release of brush interior photosensitive surfactant molecules into the bulk solution during illumination of the macroscopic area. The release of surfactant molecules generates local-light driven diffusioosmotic flow (*l*-LDDO) around each particle similar to "naked" porous silica particles [3,4]. On a macroscopic scale the lateral *l*-LDDO flow separates all brush modified particles uniformly at the interface resulting in extremely long range diffusioosmotic repulsion. In this work we systematically studied how the extend of particle motion depends on different parameters such as light intensity, surfactant concentration and the amount of adsorbed surfactant.

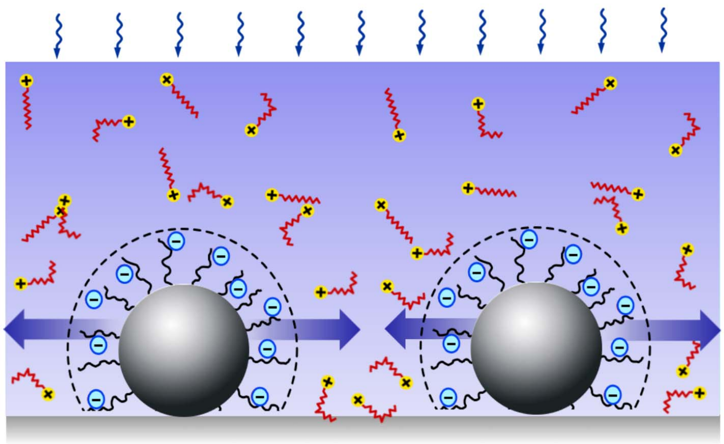

Fig. 1: Cartoon of particle-particle repulsion under illumination with blue light.

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[2] Santer, S. Journal of Physics D: Applied Physics, 51, 013002 (2017).

[3] Feldmann, D.; Arya, P.; Molotilin, TY.; Lomadze, N.; Kopyshev, A.; Vinogradova, O. I.; Santer, S. Langmuir, 36, 6994 (2020).

[4] Arya, P.; Jelken, J.; Feldmann, D.; Lomadze, N; Santer, S. The Journal of Chemical Physics, 152, 194703 (2020).