Brownian diffusion of partially wetted colloids and active motion of Janus colloids at the interface

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The talk is divided into two parts. First, I will show some experimental results obtained in my group on the Brownian dynamics of micrometric spherical silica colloids trapped at a planar air-water interface. The particle contact angle is finely tuned in the range 30°-140° by surface treatments and measured in situ at 0.5° resolution by a homemade Vertical Scanning Interferometer. Translational diffusion coefficients of colloids trapped at the water interface are obtained by particle tracking video-microscopy. Counter-intuitively, the diffusion coefficient decreases when the contact angle increases (i.e. when particles are less immersed in water and more in air). To explain the slowing down of the diffusion, I will discuss the effects of the hydrodynamic friction together with an extra friction term originating from the contact line fluctuations.

The second part of the talk deals with the active motion of Janus colloids. Here, we have investigated the motion of self-propelled colloids at the air-water interface, where particles have been confined. The interplay of colloid's self-propulsion, given by an asymmetric catalytic reaction occurring on the colloid, and interfacial frictions controls the direction and the speed of the movement. Two dimensional motion of micron-sized Silica-Platinum Janus colloids have been experimentally measured by particle tracking video-microscopy under increasing concentration of the catalytic fuel, i.e. H2O2,. Compared to previous bulk investigations, we observe a dramatic enhancement both of the length of trajectories travelled by particles and the speed. The slowing down of the rotational diffusion at the interface, also measured experimentally, plays a pivotal role in the control and enhancement of active motion.