

M2 of final-year internship Material Sciences, Soft Matter, Colloids

Dates: 4 to 6 months from February 2023

Contacts: Julie Goyon (julie.goyon-trohay@univ-eiffel.fr)
Xavier Chateau (xavier.chateau@enpc.fr)

Required profile: Master or Eng. Material Sciences or Physics
Interest in experimental work



Effects of additives on the contact properties of colloids particles

Colloidal suspensions are ubiquitous in our daily life (cosmetics, food, fresh building materials, environmental fluids, ...). When the solid volume concentration is large enough (30% or more) the rheology of these materials is controlled by interactions between particles, whether they are contact or very close to each other. For practical purpose, it is possible to control the rheology of these suspension by adding polymers that modify the interactions by adsorbing on the particle solid surface.

Despite their practical and fundamental importance, our understanding of the physics of these systems remains very limited due to the experimental difficulties to characterize the interparticle interactions: these suspensions are dense and opaque and the forces between particles can be of the order of a few piconewtons for spacings of a few Angstroms. The rheology of colloidal suspensions is thus a very active and multidisciplinary field of research.

By combining optical tweezers measurements, rheometry tests and confocal microscopy observations, our team has recently shown that the particular rheology of silica particle suspensions in a saline solution is due to the existence of aging adhesive contacts between the particles.

The objective of this experimental internship is to study how the addition of a polymer additive modifies the contact between silica particles. For this purpose, an optical tweezers device will be used to perform approach and retraction experiments for a pair of particles under different experimental conditions (nature and concentration of the additives, nature of the suspending fluid, particle size, ...). The contact mechanical properties (adhesive or not), the force-displacement relationship at the approach and retraction (contact opening) as well as the effect of the contact time between particles will be studied.

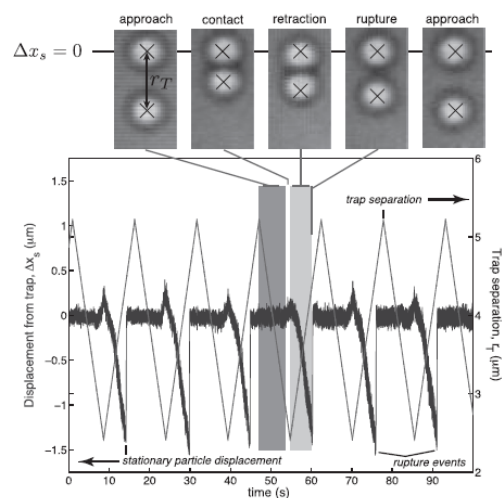


Figure from K. A. Whitaker & E. M. Furst.
J. Rheol. 60(3), 517-529 (2016).

This experimental internship will allow the trainee to develop skills in characterization techniques and physical chemistry of colloids, microscopy and micro-rheology.

Possibility to apply for a PhD scholarship (Doctoral School SIE)

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