

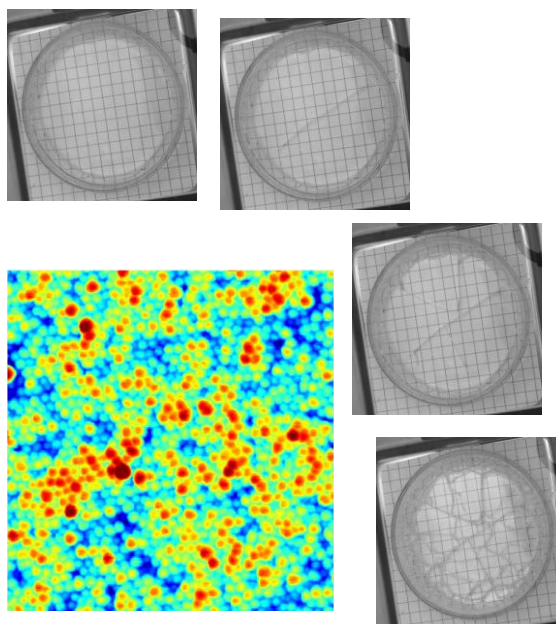
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Laboratoire SPHYNX

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## INTERNSHIP/PHD POSITION

### ROLE OF THE DRYING RATE ONTO THE NANO-STRUCTURE OF FILMS FORMED BY THE EVAPORATION OF COLLOIDAL SUSPENSIONS

Drying a colloidal suspension yields the formation of a thin solid film with varying porosity, optical transparency, and resistance to fracture. This process is central in many industrial applications : sol-gel processes for glasses, ceramics, nanocomposites or organo-mineral hybrid in chemistry & pharmacology painting and protective coating in glass and aerospace industries, high-performance plaster and concrete in civil engineering... Understand and subsequently predicting and controlling the mechanisms driving the fracture resistance, porosity, stiffness and optical properties of the so-obtained film represents a major challenge. These macroscopic properties are the signature of nanoscopic properties: organisation and nature of the chemical bonds within the porous media.



The objective is to study, on a model colloidal suspension (Nanoscale silica beads in suspension) the influence of the drying rate, film thickness and bead dimension and polydispersity on the above macroscopic properties. Indentation tests, acoustic measurements, mercury porosimetry, and optical index measurements will be performed at macroscopic scales. At the nanoscale, we will use an in-house new generation AFM dedicated to real-time imaging of nanomechanical properties (elastic moduli, local adhesion...) down to scales of the nanometers.

*This interdisciplinary PhD subject lies between statistical physics, continuum mechanics and nanosciences. The selected candidate will have the opportunity to use, and to familiarize himself/herself with, both the theoretical and experimental techniques developed in these three fields. In this context, he/she will benefit from the advising of researchers with expertise in the three fields. This PhD topic, combining both fundamental aspects and potential industrial applications, will permit the candidate to find job openings either in the academic field or in industry.*

### CONTACTS :

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