

Post-doc on heterogenous adhesion

Context

The goal of the funded ANR Project *HELDYN (Heterogenous Line Dynamic)* is studying the physics of propagation of debonding front lines at the interface between a soft dissipative material and a solid substrate presenting heterogeneous surface properties on well-defined geometrical patterns. Since such triple lines are singularities which have to be regularized in some way, several length scales are involved in typical front problems which may extend all the way from the macroscopic far field down to the atomic scale details at the surface. Since the target materials range from viscous fluids to viscoelastic adhesives, we aim at combining experimental techniques and modeling approaches coming from both communities of fluids and solid mechanics, though a collaboration with CEMEF laboratory (MINES PSL) and MSC laboratory (Université Paris Cité).

Scientific work

The SIMM laboratory and in particular Matteo Ciccotti, Etienne Barthel and Costantino Creton have a combined extensive experience in the characterization of adhesive properties of soft materials [1-3], on the development of custom test procedures and on the analysis of the results. The objective of the post-doc is to develop custom techniques to characterize the debonding mechanisms of a range of well-defined soft materials over patterned substrates (typical length-scales 20-500 μm) and to relate the macroscopic work of debonding to the complex morphogenesis that spontaneously emerges from the interaction of soft debonding fronts with the geometrical adhesion patterns. A specific set of experiments will be devoted to the modeling of the physics of debonding of a single soft fibril originated by the adhesive contact over a single sticky patch on the substrate.

Profile

We are seeking a post-doctoral researcher with a background in experimental approaches to soft matter mechanics. A knowledge of soft matter science (physical chemistry, material science or physics, polymers) is a strong plus.

Practical details

The work will be carried out within the laboratory of Soft Matter Science and Engineering and start as soon as possible, but ideally in September 2023. It will be supervised by Prof. Matteo Ciccotti and Dr. Etienne Barthel. Send applications to : matteo.ciccotti@espci.psl.eu, etienne.barthel@espci.psl.eu.

The project will be in collaboration with CEMEF laboratory (MINES PSL) and MSC Laboratory (Université Paris Cité).

Duration and Salary level: 1 year contract renewable once, CNRS salary grid based on experience.

References

- [1] J. Chopin, R. Villey, D. Yarusso, E. Barthel, C. Creton, and M. Ciccotti, *Macromolecules* **51**, 8605 (2018).
- [2] P. Fourton, K. Piroird, M. Ciccotti, and E. Barthel, *Glass Structures & Engineering* **5**, 397 (2020).
- [3] C. Creton and M. Ciccotti, *Rep Prog Phys* **79**, 046601 (2016).