

Master 2 internship and PhD proposal

Acousto-rheological materials

Laboratoire de Physique – CNRS UMR 5672 – Ecole Normale Supérieure de Lyon

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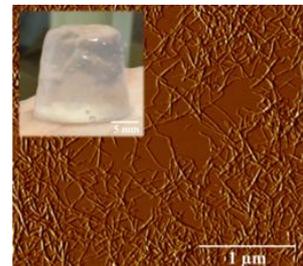
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Gels, creams, pastes, suspensions, paints, foams, polymers: “soft materials” are ubiquitous in everyday life and in industries such as construction, pharmaceuticals, cosmetics, food, plastics, etc. A good control of their structure and mechanical properties is key for manufacturing processes as well as applications. Among the various stimuli used to interact with the structure of soft materials (including temperature, pH, electrical and magnetic fields), it appears that the effects of ultrasound have scarcely been explored, although ultrasonic applications to medical imaging and therapy are legion. We propose to **use high-intensity ultrasound as an original way to structure and control soft solids**, starting from a fundamental study all the way to applications.

The goal of the internship (then of the PhD work) is to develop an experimental setup **coupling high-intensity ultrasound to optical (microscopy) and mechanical (rheometry) characterizations** in order to study the structural modifications induced by ultrasound. The setup will allow us to explore the response of a variety of model soft solids to ultrasound: colloidal gels, biopolymer gels, protein gels or particle suspensions in complex fluids. Collaborations are programmed with INSA de Lyon and the Laboratoire de Rhéologie des Procédés in Grenoble as well as local industries, in order to study systems made of cellulose nanofibers and to consider applications to filtration problems and to material design.



Gel made of cellulose nanofibers and its structure as seen under an atomic force microscope.

The candidate should have a strong background in general physics with emphasis on mechanics, soft matter as well as experimental physics.

The PhD will be funded by the Région Auvergne-Rhône-Alpes and is scheduled to start in September 2018.