

**MASTER DE CHIMIE DE PARIS CENTRE - M2S2**

**Proposition de stage 2021-2022**

**Internship Proposal 2021-2022**

**Parcours type(s) / Specialty(ies) :**

- Chimie Analytique, Physique et Théorique / *Analytical, Physical and Theoretical Chemistry* :
- Chimie Moléculaire / *Molecular Chemistry* :
- Chimie et Sciences Du Vivant / *Chemistry and Life Sciences* :
- Chimie des Matériaux / *Materials Chemistry*:
- Ingénierie Chimique / *Chemical Engineering*:

**Laboratoire d'accueil / Host Institution**

Intitulés / *Name* : Laboratoire Sciences et Ingénierie de la Matière Molle (SIMM)

Adresse / *Address* : 10 rue Vauquelin, 75231 Paris Cedex05

Directeur / *Director (legal representative)* : Etienne BARTHEL

Tél / *Tel* : 01.40.79.44.22

E-mail : [etienne.barthel@espci.fr](mailto:etienne.barthel@espci.fr)

**Equipe d'accueil / Hosting Team** : Colloids, Assemblies and Interfacial Dynamics (CAID)

Adresse / *Address* : 10 rue Vauquelin, 75231 Paris Cedex05

Responsable du stage (encadrant) / *Direct Supervisor* : N. Sanson, C. Monteux, A. Kovalenko

Fonction / *Position* : Maître de Conférence et Chercheurs CNRS

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Période de stage / *Internship period* \* : 01/02/2022-01/07/2022

**Destabilization of emulsions in contact with inorganic solid surfaces**

**Projet scientifique (1 page maximum) / Scientific Project (maximum 1 page):**

**Keywords:** emulsions, surfactants, solid-liquid and liquid-liquid interfaces

**Scientific description:**

In the field of road surfaces, a bitumen emulsion is mixed with solid particles composed of either silica (quartz, granite), silicates (mica, diorite) or carbonates (calcite, dolomite). In this process, a rupture of the emulsion followed by the removal of the water ultimately leads to the formation of a continuous film of bitumen (coating) on the particles ensuring the adhesion of the particles between them.

Among the hypotheses that can explain the destabilization of the emulsion in contact with the aggregate, we can mention an adsorption of surfactants on the mineral surface, which would then unfold the oil drops or a precipitation of the surfactant because of a local change in pH due to the dissolution of the aggregates. The goal of the internship is a thorough understanding of the rupture mechanisms that control this destabilization by focusing mainly on the behavior of surfactants in different physicochemical parameters such as the nature of the solid surface, pH, ionic strength, ...

For this, we will first study the interaction between surfactants and a suspension of model solid particles (silica or calcite) by tracing adsorption isotherms at different pH. Then we will produce model emulsions and study the stability of these emulsions in contact with solid particles as a function of pH. Finally, we

\* min. 5 mois à partir du 31 janv 2022 / *min. 5 months not earlier than January, 31st 2022.*

Fin de stage au plus tard le 15/07/2022 ou le 30/09/2022 (dates de validation de diplôme). / *End of internship at the latest July 15, 2022 or Sept. 30, 2022 (dates of graduation).*

will study the behavior of a single oil droplet in water when it is put in contact with a solid surface. We will study by interferometry the stability of the aqueous wetting film between the drop and the solid.

**Techniques/methods in use:** microscopy, interferometry, interfacial tension, TOC (Total Organic Carbon).

**Applicant skills:**

- General knowledge of soft matter, physical-chemistry of interfaces
- Experimental skills
- Reporting and communication skills

**Industrial partnership:** with Colas

**Internship supervisor(s) (name, email, phone, webmail):**

N. Sanson ([nicolas.sanson@espci.fr](mailto:nicolas.sanson@espci.fr)), C. Monteux ([cecile.monteux@espci.fr](mailto:cecile.monteux@espci.fr)), A. Kovalenko ([artem.kovalenko@espci.fr](mailto:artem.kovalenko@espci.fr))

Internship location: Soft Matter Science and Engineering (SIMM) laboratory at ESPCI, a joint CNRS-ESPCI-SU laboratory, 10 rue Vauquelin 75005 Paris

**Possibility for a Doctoral thesis:** to be discussed later in 2022