

PhD position at IFP Energies nouvelles (IFPEN) Physical sciences – Physical-chemistry – Microfluidics

Study of dynamic interfacial properties with a microfluidics tensiometer: Experimental and multi- scale approach

Emulsions are systems present in many industrial processes and products. Their stability depends on the density difference between the dispersed and continuous phases and on their rheology (creaming or sedimentation), on the interactions between the drops (coalescence) and on their polydispersity (Oswald ripening). The interactions between the drops are notably governed by the value of the interfacial tension (IFT) and by the kinetics of diffusion and adsorption of the surfactants at the interfaces. These parameters must be determined under the pressure and temperature conditions of the process and the final application as well as on the appropriate time scale. Currently, only the kinetics of diffusion and adsorption at times greater than a hundred milliseconds have been studied in the literature, for lack of tools adapted to shorter times. A tensiometer has been developed at IFPEN (Moiré et al., *Langmuir* 2017, 33, 10, 2531-2540) to reach time scales of the order of a millisecond under the pressure and temperature conditions of industrial application (up to 125 bar and 125°C) and over four orders of magnitude of interfacial tension. The challenge given to the PhD student will be to exploit the potential of this unique tensiometer to describe the phenomena of transport of surfactants at very short times. She/he will use the results obtained to optimize the current geometry of the tensiometer to extend the time scale of interfacial tension measurement. The objective is to go up to times of a few tens of minutes of phase equilibration.

Keywords: Physical-chemistry, Interfacial tension, Kinetics, Microfluidics, High-throughput experimentation

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PhD location	IFP Energies nouvelles, Rueil-Malmaison, France
Duration and start date	3 years, starting in fourth quarter 2022
Employer	IFP Energies nouvelles, Rueil-Malmaison, France
Academic requirements	Master degree in physical-chemistry with good knowledge in fluid mechanics
Language requirements	Fluency in English, French or German, willingness to learn French
Other requirements	Microfluidics, Matlab, CFD software appreciated

To apply, please send your cover letter and CV to the IFPEN supervisor indicated here above.

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