INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	LadHyX
Website of the Host Laboratory	www.ladhyx.polytechnique.fr
Research Group	
Internship Supervisor	Sébastien Michelin
Internship Subject	Growth of a viscous microbubble near a chemically-active surface
Student's level	☒ Advanced Undergraduate Students (3rd or 4th year) ☒ Master's students (1st or 2nd year) ☒ PhD students
Proposed Duration	☒ 3 months ☒ 4 months ☒ 5 months ☒ 6 months
Prerequisites	Viscous flows, diffusion, partial differential equations, some Matlab/Python experience
Internship description (max. 15 lines)	In many different applications, microscopic gas bubbles form and grow near a solid surface where a dissolved gas is released either through chemical reactions, electrolysis or diffusion, and a saturation concentration is reached locally. The growth and motion of the bubble is then controlled both by the diffusion of the dissolved gas and the bubble dynamics under the combined effects of hydrodynamic stresses and buoyancy or local confinement. This process is responsible for several designs of synthetic micro-robots, so-called « micro-rockets ». It also occurs during the industrial production of glass and can significantly impact the mechanical and/or physical properties of the final product. This project, which will be supported by and managed in collaboration with St Gobain Research, will analyze the complex and coupled dynamics of the diffusing gas and of the hydrodynamic flow. In a recent work, focusing solely on the hydrodynamic problem, we demonstrated how the nature of the bubble surface can critically control the drainage and dynamics of the liquid film separating the bubble from the active wall. The present project will build on this knowledge to include the coupling to the physico-chemical problem and characterize different dynamical regimes.