

Electrostatic effects in bubbly flows

Internship position | MSc 2 or equivalent

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Gas-expanded solvents, formed by dissolving dense CO₂ into liquids, exhibit impressive property changes: volume expansion up to 900%, modified viscosity, and enhanced solute diffusivity. These systems, out of their thermodynamic equilibrium, are solutions with stable nanoscale bubbles (50 nm radius, lifetimes of weeks) at concentrations up to 10¹⁶ bubbles/L or 60% volume fraction, where bubble stability is so far assumed to be driven by surfactants, electrostatics, and Marangoni effects.

Project

Assuming that nanobubbles are surrounded by an electrical double layer, the focus is on studying the electrostatic effects on the collective motion of bubble swarm. Direct Numerical Simulations (DNS) of 2D bubbly flows will be performed using the open-source software Basilisk (www.basilisk.fr). The simulations will be computed on the regional HPC cluster Gricad (gricad.univ-grenoble-alpes.fr). The objective is to determine the influence of EDL on bubble coalescence, and specifically to quantify the volume fraction from which EDL prevent coalescence. If time allows, code development for computing 3D DNS will be considered.

Requirements

2nd-year MSc or final-year engineering student. A strong knowledge of Fluid Mechanics and solid programming skills (Python-like) are expected. Knowledge of C++ is a plus. Technical English is required. The candidate must have a degree of autonomy.

Starting date, localisation, duration and allowance

Start in Feb. 2026 at SIMaP. Last up to 26 weeks. ~660€/month.

Application

Please send your CV (1 page max.), a motivation letter (1 page max.) and the transcripts of the last two academic years to romain.vallon@grenoble-inp.fr