

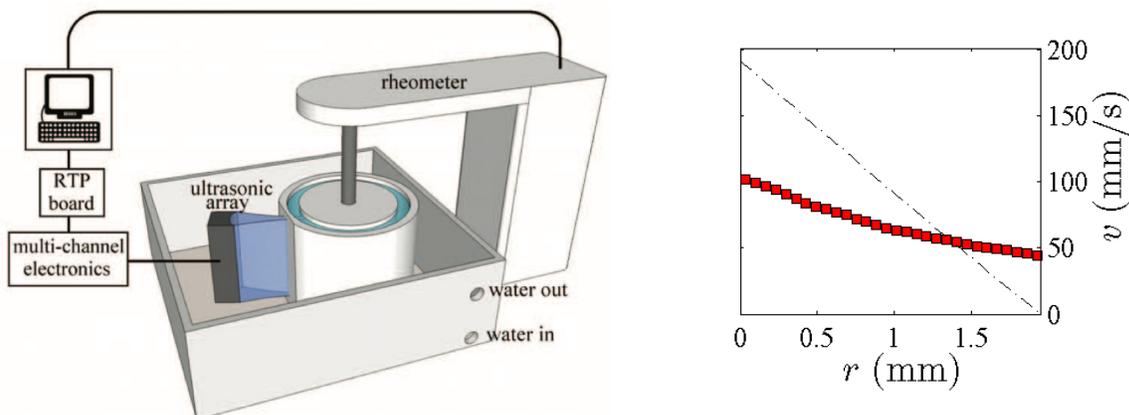
Master internship proposal in Wien/Lyon (at M1 or M2 level)

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Global and local rheology of cement slurries

This international collaborative research work crosses both fundamental and applied problems on one of the most widespread material in the world: cement. The main focus of this project is to define a reliable and systematic mechanical characterization of fresh cementitious materials, which is critical for material processing, placement and final solid properties. Both global and local rheology will be used to investigate the development of materials heterogeneities under shear^[1] (i.e. particle migration, sedimentation, lubrication layer) and their physical origin, thanks to classical rheometry (TU Wien) and ultrasonic imaging^[2] (ENS Lyon), see figure below. For the first time, local velocity measurements will provide insights into the complex flow dynamics of fresh cement pastes under shear.



Left: Ultrasound imaging coupled to rheometry.^[2] Right: preliminary velocity profile measured on a cement paste and showing strong slippage at both walls. The dash-dotted line shows the velocity profile of a Newtonian fluid.

Prerequisites

- General background in Physics, Chemistry or Material science
- Basic experimental knowledge with interest in fluid mechanics, complex fluids and rheology
- English or German intermediate knowledge

Duration – 3 to 6 months at Master 1 or Master 2 level between January and September 2020 with a possibility of follow-up with a PhD thesis.

Keywords – Yield stress, dense suspensions, rheology, wall slip, velocity profiles, ultrasound imaging, data analysis and modelling (Matlab or Python)

References

- [1] G. Ovarlez *et al.* Flows and heterogeneities with a vane tool. *Journal of Rheology* **55**, 197-223 (2011).
[2] T. Gallot *et al.* Ultrafast ultrasonic imaging coupled to rheometry. *Rev. Scientific Instruments* **84**, 045107 (2013)