

PhD position – 2025-2028

Study of the dissolution of minerals at the mesoscale

Scientific context

The dissolution of mineral materials, like cement or limestone, plays a central role in the manufacturing of building materials and in the sustainability of the built heritage. However, fundamental aspects of the dissolution of minerals remain unexplained, among which the role of the geometry of the dissolving grains, the influence of the roughness of the material, or the existence of a steady state of dissolution. The feature in common of these problems is that they concern the **mesoscopic scale of the dissolving material**, between the atomic and macroscopic levels.

Missions

The current PhD thesis aims at bridging the gap between these levels. It will use for this a multiscale approach and address the relevant questions with various physical tools to evidence the leading mesoscopic topographic changes during dissolution and their influence on the dissolution rate, in model minerals and in sustainable building materials. The thesis will be split in two periods:

1) **At Institut Lumière Matière of University Lyon 1 (France)**, during two years, the **fundamental aspects** of the mesophysics of mineral dissolution will be addressed. During this stay, the PhD candidate will develop a flow cell and use it to investigate the fate of meso-objects (mineral grains, rough surfaces, pores) during the dissolution of model materials (gypsum, calcite) using mainly atomic force spectroscopy, vertical scanning interferometry and scanning electron microscopy.

2) **At the geoscience department of the University of Padua (Italy)**, during one year, the PhD candidate will test the **application** of these results on construction materials. He/she will perform batch dissolution experiments of mineral phases present in promising alternative building materials.

Lyon and Padua collaborate in the framework of the Arqus European University Alliance, which funds the exchanges between the two locations, while Université Lyon 1 finances the doctoral scholarship.

Candidate

We are seeking a motivated early-career researcher with a background in physics, materials science, chemical engineering or related subject areas, motivated by scientific experimentation, and open to live an international experience in France and Italy. We value independence and responsibility while promoting collaboration among colleagues.

French laboratory:

Institut Lumière Matière, liquids and interfaces team
Université Claude Bernard Lyon 1 and CNRS, Villeurbanne, France

Italian laboratory:

Dipartimento di geoscienze
Università degli studi di Padova, Padua, Italy

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