



Post-doctoral project

Towards quantitative “color” microtomography

X-ray microtomography is a technique that delivers a three-dimensional image of a sample from a series of radiographs. The assets of this technique are two-folds. First, it is non-destructive and requires minimal sample preparation: it therefore allows the **observation of the internal structure of a material without altering it**. Second, this technique offers an **excellent spatial resolution** (typically, a few micrometers; up to fractions of microns in optimal conditions). X-ray microtomography is therefore an ideal tool for the investigation of geomaterials that exhibit a complex and hierarchical microstructure at these scales.

At laboratoire Navier (Ecole des Ponts, Univ Gustave Eiffel, IFSTTAR, CNRS, Marne-la-Vallée, France), we run a tomography setup with exceptional technical characteristics that allow us to develop original *in-situ* experiments. We have recently acquired a dual-energy, photon counting imager that paves the way to spectral microtomography, which expands the dimension of the information available at each voxel in the reconstructed 3D images. In simplified words, it allows to assign a “color” to each voxel, representing the local physical characteristics of the investigated sample. This is an exciting, state-of-the-art perspective that we are currently investigating actively. It requires a number of new developments regarding the methodology (acquisition, reconstruction and denoising) as well as the assessment of the accuracy (spatial and spectral resolution) that would lead to a set of general purpose recommendations for the team members. We offer a 18-month post-doctoral position at Navier Laboratory. The post-doctoral fellow would be fully integrated within our research team and would support our efforts towards the production of our first, fully calibrated spectral tomographic images. As first applications, the developed methodology will be applied to the identification of the poorly contrasted phases of some limestone or clayey rocks or the monitoring of carbonation, sulfate attack, or salt crystallization in cementitious materials.

This research project is financially supported by Labex MMCD (mmcd.univ-paris-est.fr) and supervised by Michel Bornert and Sébastien Brisard (researchers at Laboratoire Navier) and Patrick Aimedieu (research engineer at Laboratoire Navier). We seek a post-doctoral fellow with an interest for methodological and metrological developments with the application to real, civil engineering materials in mind. Background knowledge in imaging techniques, image analysis, numerical methods (including inverse problems) are required. Programming skills would also be appreciated. Applications (cover letter, electronic copy of PhD thesis and all publications, at least two referees) should be sent to M. Bornert (michel.bornert@enpc.fr) and S. Brisard (sebastien.brisard@univ-eiffel.fr).