

# High Temperature behaviour of Concrete revealed by in-situ coupled neutron and x-ray tomography and thermo-hydrromechanical modelling

Concrete is by far the most used construction material worldwide. Its mechanical resistance is relatively well understood but its behaviour at the high temperature typical of fire conditions, for example, is not. In these conditions, it has a predisposition to more or less violently eject layers (a phenomenon named spalling). This process reduces the working cross section of the structural element and can expose the reinforcements, leading to the failure of the structure.

This project aims at improving our understanding of the fundamental mechanisms driving spalling through a synergic combination of advanced experimental investigations and state-of-the-art numerical modeling.

**In particular, the PhD will focus on the study of the hydro-mechanical interactions that are to be one of the key driving sources of spalling.** We will develop an experimental apparatus to study the development of cracks and spalling while acquiring simultaneous X-ray and Neutron tomography, a recently developed possibility. An existing thermo-hydro numerical code for porous media based on TCAT (Thermodynamically Constrained Average Theory) will be adapted to this unusually short time scale and enhanced based on the wealth of information provided by the experimental developments.

We are looking for a highly motivated candidate with a M.Sc. in Civil Engineering, Mechanical Engineering, Material Science or Physics or closely related field. A taste for numerical computations and programming (e.g., Python) is desirable for the numerical as well as for the experimental part. The candidate should be fluent in English. We are offering a collegial, international and interdisciplinary working environment. The ILL is the most intense source of neutrons in the world, and the student will work on cutting-edge large-scale instruments, on a highly international and multidisciplinary campus located at the heart of the French Alps.

**How to apply:** Please send an email to Prof. Stefano DAL PONT ([Stefano.dalpont@univ-grenoble-alpes.fr](mailto:Stefano.dalpont@univ-grenoble-alpes.fr)) and A. Prof. Alessandro TENGATTINI ([tengattini@ill.fr](mailto:tengattini@ill.fr)) with the subject “IME-2023-04-YourName”. Please attach **a single pdf** including a brief motivation letter, CV, Bachelor certificate and Master certificate (or score excerpt), a short abstract of your Master thesis and at least one contact person to act as a reference. Do not hesitate to contact S.DAL PONT for further information. This project is open for applications until 30 April 2023 and will be closed before this date if a suitable candidate has been found.

Additional details about the specific conditions for the PhD and the application procedure, please consult the following link: <https://www.ill.eu/careers/all-our-vacancies/phd-recruitment/open-phd-positions>