

Post-doctoral position

Coupled chemo-mechanical modelling for assessing the durability of cementitious materials.

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Context

The durability of cementitious materials is a key point for the safety of radioactive waste repositories, as well as for other geosciences applications. Over the lifetime of the repository, interactions between the groundwater and reactive gases can induce several physicochemical perturbations on the cementitious materials which may result in a loss of their confinement properties. In particular, reaction of cement phases with CO₂, carbonation, leads to a mineralogical evolution of the material which may trigger the appearance of cracks, accelerating the degradation and potentially trigger steel corrosion. To describe the long-term impact of these processes, it becomes essential to consider these coupled chemical and mechanical interactions. The MAGIC project of the european program EURAD aims at improving the description of coupled chemo-mechanical processes impacting the durability of cementitious materials in repository conditions.

Work

Through this european project, a post-doctoral position is funded for a collaboration between the Centre de Géosciences (Mines ParisTech, Fontainebleau) and the LECBA (CEA Saclay). It will be supervised by Nicolas Seigneur (Mines ParisTech) and Benoit Bary (CEA Saclay). The postdoctoral project aims at improving our description of atmospheric carbonation by coupling two existing codes. Hytec (Mines ParisTech) deals with the multiphase transport of dissolved and gaseous species as well as the chemical reactions describing the solid-liquid-gas equilibrium. Cast3M is a mechanical software devoted to estimate the mechanical response of the material. The postdoc will work on an external coupling between these two softwares to be able to estimate the internal stresses generated by geochemical reactions, as well as the mechanical response and its feedback on transport processes.

Profile

Young researcher with skills in numerical modelling, as well as good knowledge of cementitious materials. Furthermore, the candidate must have obtained a PhD involving aspects of material or structural mechanics, and/or geochemistry and reactive transport. The candidate must have an appeal to work within a team in a project linking the academic and industrial world.

Practical aspects

This 18 months project is funded by european program EURAD (Work package MAGIC). The postdoc will mainly be located in Fontainebleau and will involve frequent travels to CEA Saclay.