

Empa is the research institute for materials science and technology of the ETH Domain and conducts cutting-edge research for the benefit of industry and the well-being of society.

The Laboratory for Concrete and Construction Chemistry is seeking for a

PhD student

(chemistry, materials sciences, earth sciences, civil & environmental engineering) in the field of cement chemistry

Cement is the most used building material and its production causes 5-8% of global man-made CO₂. One of the possibilities to decrease these emissions, which are mainly due to the decarbonation of limestone, is to replace a part of the cement by supplementary cementitious materials (SCMs). However, the industrial application of SCMs is hindered by the fact that such novel, low CO₂ cementitious materials have different chemical compositions and lead to the formation of different hydrates.

Calcium silicate hydrate (C-S-H) is the main hydrated phase in ordinary Portland cement and undergoes a drastic modification in the presence of SCMs rich in silica. The uptake of aluminum and alkali in C-S-H is increased. The goal of the present project will be to understand the different mechanisms involved in the aluminum and alkali uptake.

In this PhD project, C-S-H phases will be synthesized in the laboratory under different conditions. Their composition will be investigated by X-ray diffraction, thermogravimetric analysis and advanced nuclear magnetic resonance spectroscopy (partially at Aarhus University, Denmark). In addition, the composition and the pH of the liquid phase will be determined.

The PhD projects will be carried out in cooperation with Prof. K. Scrivener, EPFL and will start early in 2018. We are looking for a student with a master in Chemistry, Materials Science, Earth Sciences, or related fields, who have good verbal and written knowledge in English. A strong background in materials science or inorganic chemistry and good skills in design and operation of experimental set-ups are an advantage. If you are motivated to perform scientific studies in an interdisciplinary group, then you are the person we are looking for.

For further information please contact Dr. Barbara Lothenbach, +41 58 765 47 88, barbara.lothenbach@empa.ch. Applications should be accompanied by a short CV and university certificates.