

## Experimental Report

**Beamline and time span:** ID11 April/May 2011

**Proposal title:** Time resolved investigations of cement hydration at early stages and the influences of organic additives

**Proposer:** Moritz-Casper Schlegel<sup>1</sup>, Franziska Emmerling, Adnan Sarfraz, Simone Rolf

<sup>1</sup>BAM Federal Institute for Material Research and Testing. Division: Analytical Chemistry, Richard-Willstaetter-Str. 11, 12489 Berlin, Germany.

**Results:** High resolution synchrotron X-ray diffraction on the ms-scale was utilized to characterize the initial hydration processes of this complex phase system on a structural level. The experiments were carried out under levitated conditions using small droplets as sample specimen. This kind of sample positioning avoids any contact with surfaces, which might influence nucleation, crystallization, and adsorption processes. The hydration of cement was influenced by polycarboxylate-ethers, which belong to the most common superplasticizers. For the first time, it was possible to describe the effect of this organic additive to the early stages of the cement hydration.

The combination of high resolution X-ray diffraction and data processing represents a perfect analytical tool for analyzing the influence of any other organic additive to different cementitious materials.

**Publication:** Schlegel, M.C., Sarfraz, A., Mueller, M., Panne, U. und Emmerling, F. "First Seconds in a Building's Life - In Situ Synchrotron X-Ray Diffraction Study of Cement Hydration on the Millisecond Timescale". *Angewandte Chemie International Edition*, 2012, **51**, 4993- 4996.