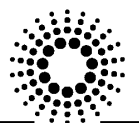


Experiment Report Form

 ESRF	Experiment title: Pozzolanic reaction mechanisms in zeolite - Portland cement mixtures using in situ synchrotron X-ray powder diffraction	Experiment number: 26-01-851
Beamline: BM01B	Date of experiment: from: 09/12/2009 to: 15/12/2009	Date of report: 21/01/2011
Shifts: 17	Local contact(s): Olga Safonova	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): Ruben Snellings*, Gilles Mertens*, Özlem Cizer* Department of Earth and Environmental Sciences, KULeuven, Belgium		

Report:

Abstract

The *in situ* early-age hydration and pozzolanic reaction in cements blended with natural zeolites were investigated by time-resolved synchrotron X-ray powder diffraction with Rietveld quantitative phase analysis. Chabazite and Na-, K-, and Ca-exchanged clinoptilolite materials were mixed with Portland cement in a 3:7 weight ratio and hydrated *in situ* at 40 °C.

The evolution of phase contents showed that the addition of natural zeolites accelerates the onset of C₃S hydration and precipitation of CH and AFt. Kinetic analysis of the consumption of C₃S indicates that the enveloping C-S-H layer is thinner and/or less dense in the presence of alkali-exchanged clinoptilolite pozzolans. The zeolite pozzolanic activity is interpreted to depend on the zeolite exchangeable cation content

and on the crystallinity. The addition of natural zeolites alters the structural evolution of the C-S-H product. Longer silicate chains and a lower C/S ratio are deduced from the evolution of the C-S-H *b*-cell parameter.

Full details in (published): Snellings R, Mertens G, Cizer Ö, Elsen J (2010) Early age hydration and pozzolanic reaction in natural zeolite blended cements: reaction kinetics and products by in situ synchrotron X-ray powder diffraction. Cement Concrete Res 40:1704-1713

