Experimental report

31/08/2018

Proposal: 7-03-167 **Council:** 4/2017

Title: Investigation of the crystallization reaction of calcium carbonate from amorphous precursor with quasielastic neutron scattering

Research area: Materials

This proposal is a new proposal

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Samples: CaCl2
K2CO3

Instrument	Requested days	Allocated days	From	To
IN6	4	0		
IN6-SHARP	0	4	16/04/2018	18/04/2018
			27/06/2018	29/06/2018

Abstract:

The crystallization of calcium carbonate is a widely studied process, but still not fully understood, despite its importance in nature and industry. Under some conditions, the process seems to follow non-classical crystallization mechanisms with the formation of a metastable amorphous precursor. The proposed experiment is focused on the investigation of the transformation of this amorphous precursor gel with quasielastic neutron scattering by probing the conversion of structurally/chemically bound water and/or water constrained/confined in the pores of the gel phase, into free water in solution (at the end of the crystallization process). It is the first time that the kinetic analysis of this conversion and the study of water dynamics at fixed times during the reaction, is attempted to provide further insights into the structure and structural evolution of the amorphous calcium carbonate gel.

Crystallization process of calcium carbonates ($CaCO_3$) was studied by following the states of water molecules during formation reaction. $CaCO_3$ are widely used in many industrial sectors and play a key role in biomineralization. Despite many scientific efforts dedicated to study this system, the crystallization of $CaCO_3$ is still not fully understood. We believe that our experiments done in ILL will bring further information for the characterization of processes ongoing during crystallization of $CaCO_3$ from water solutions. The obtained data are now under evaluation.