

## Enhanced uptake of Sr into calcite via an amorphous calcium carbonate precursor: An EXAFS study.

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Strontium typically incorporates into calcium carbonates through the distortion of the carbonate lattice, producing 6-fold and 9-fold Sr coordination in calcite and aragonite respectively [1]. Uptake is controlled by physiochemical factors and the mechanism of formation [1-2].

Trace-metal uptake to carbonates is often described in terms of a distribution coefficient ( $k_d$ ) where the metal/Ca ratio in the precipitated calcium carbonate mineral is controlled by the metal/Ca ratio in solution [3].  $K_d$  values of < 1 mol % Sr-substitution into calcite have been reported [3]. Here we present a novel synthesis procedure, in which significantly higher  $k_d$  values of 10 mol % Sr substitution have been achieved.

By rapidly mixing equal volumes of  $\text{SrCl}_2/\text{CaCl}_2$  and  $\text{Na}_2\text{CO}_3$  at room temperature we observed the formation of an unstable ACC precursor within seconds of mixing. XRD and SEM data showed that this crystallised within minutes forming a metastable vaterite phase, and after 3 hours fully crystallised to calcite. Sr K-edge EXAFS spectroscopy was used to elucidate the exact mechanism of Sr incorporation and local Sr bonding environment during the ACC, vaterite, and calcite transformations as a function of Sr concentration. This synthesis route potentially offers a viable low-cost treatment option for <sup>90</sup>Sr contaminated land and effluent wastes.

[1] Parkman R.H. *et al Geochim. Cosmochim. A.*, (1998) p1481. [2] Pingitore Jr N.E. *et al Geochim. Cosmochim. A.*, (1992) p1531.[3] Tesoriero A.J. and Pankow J.F. *Geochim. Cosmochim. A.*,(1996) p1053.