

Supporting information for

EXAFS study of Sr sorption to illite, goethite, chlorite and mixed sediment under hyper-alkaline conditions

Adam J. Fuller¹⁺, Samuel Shaw², Caroline Peacock¹, Divyesh Trivedi³ and Ian Terence

Burke^{1}*

¹School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, UK

²School of Earth, Atmospheric and Environmental Science, University of Manchester, Manchester, M13 9PL, UK

³National Nuclear Laboratory Ltd, Chadwick House, Warrington Road, Birchwood Park, Warrington, WA3 6AE

+ Present address: Centre for Radiochemistry Research, School of Chemistry, University of Manchester, Manchester, M13 9PL

*Corresponding author Tel: +44113 3437532 E-mail: i.t.burke@leeds.ac.uk

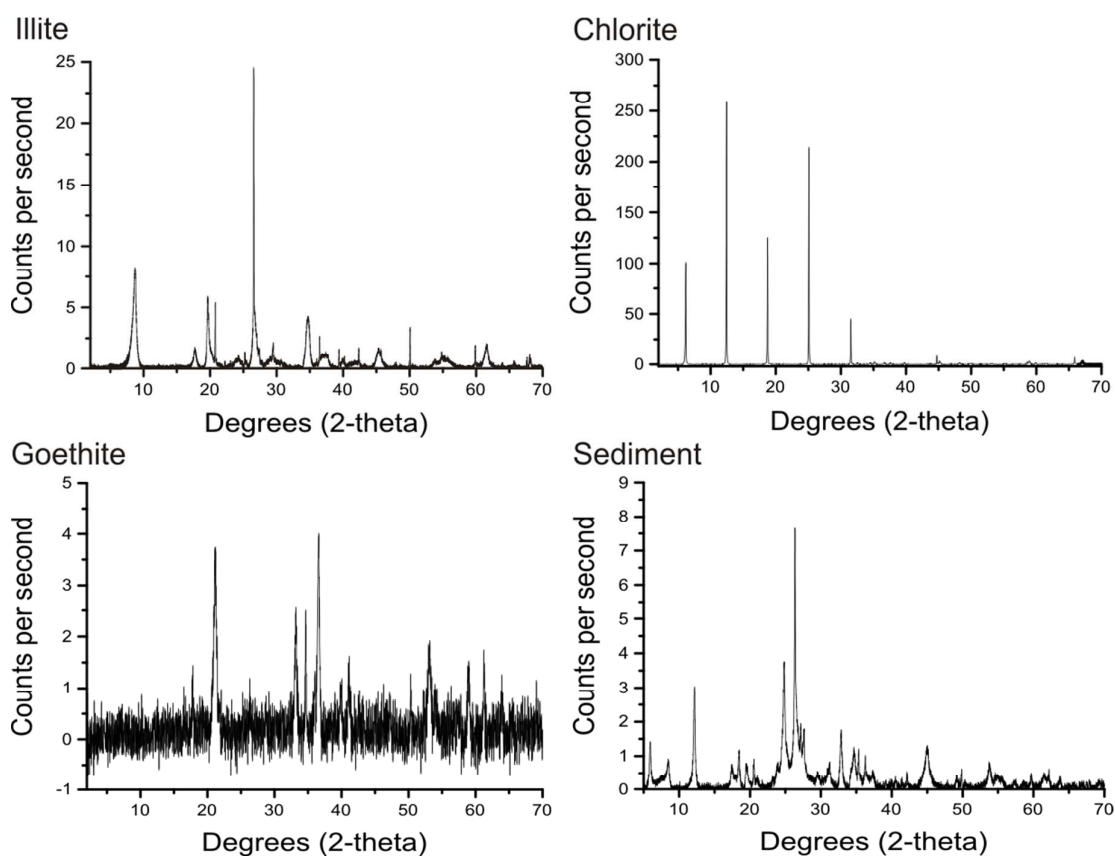


Figure S1. X-ray diffraction spectra to confirm the identity of the four minerals was as expected. The XRD of the sediment is reproduced from Wallace et al (2012)

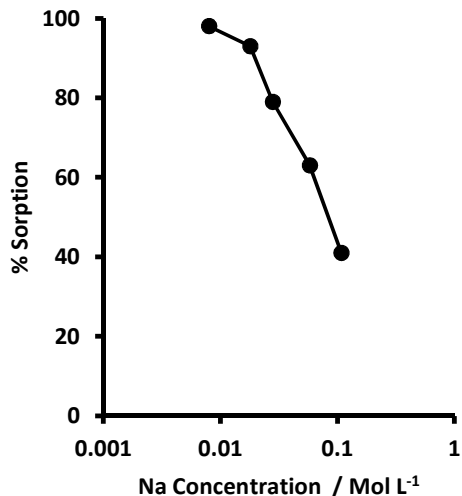


Figure S2. ^{90}Sr sorption to the natural mixed sediment as a function of increasing Na concentrations at pH 6.5 ± 0.5 in a NaHCO_3 buffered groundwater solution. (Data redrawn from Wallace et al., 2012.)

Comparative spectra

A primary conclusion of this work is that the Sr is primarily associated with the mineral surfaces at high pH via the formation of an inner-sphere complex. As a number of other authors have observed the formation of Sr-zeolite phases a comparison to the existing literature EXAFS spectra is of value. As noted in the main text the EXAFS spectra seen in the study vary from those seen for zeolite phases, below.

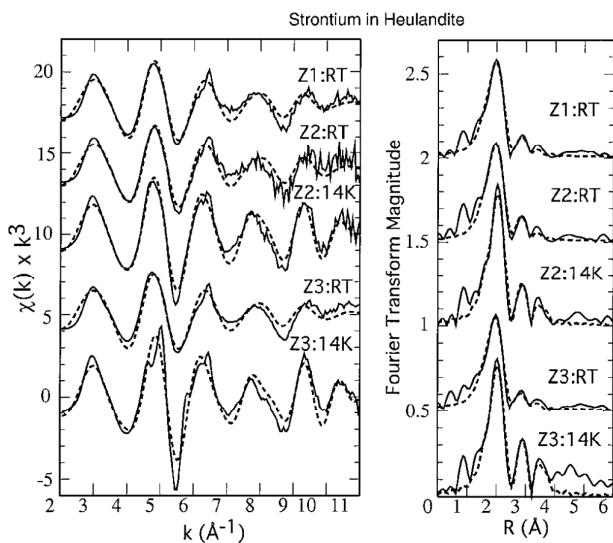


Figure S3. Strontium incorporated into heulandite (a common Sr-zeolite) measured at different temperatures. Reproduced from O'Day et al³⁹.

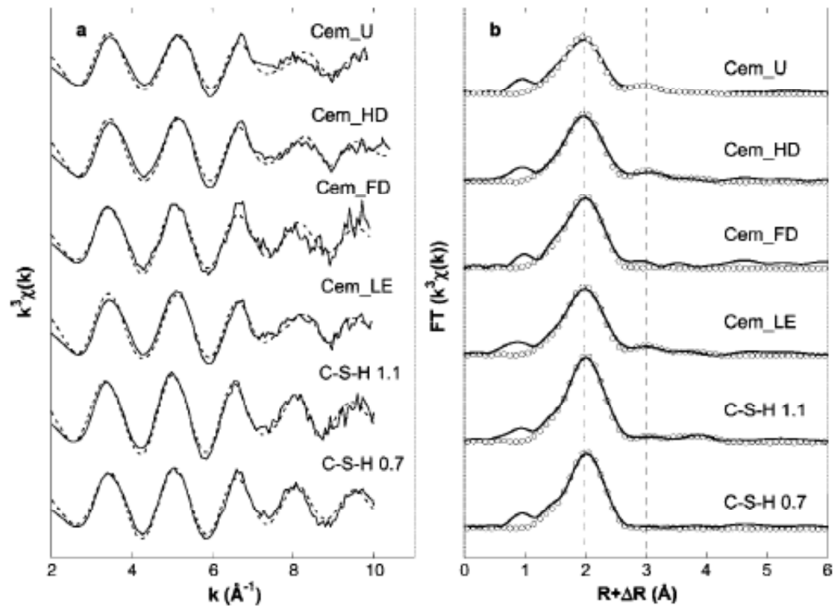


Figure S4. Strontium incorporated into calcium silicate hydrate phases, reproduced from Wieland et al²⁰

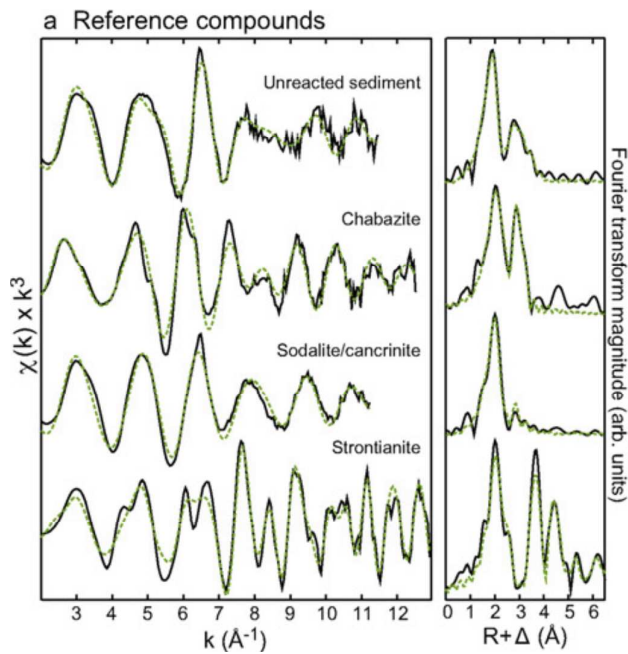


Figure S5. Reference strontium bearing minerals, including common production of hyperalkaline mineral transformations. Unreacted sediment is taken from the Hanford site, USA. Reproduced from Perdrial et al⁴¹