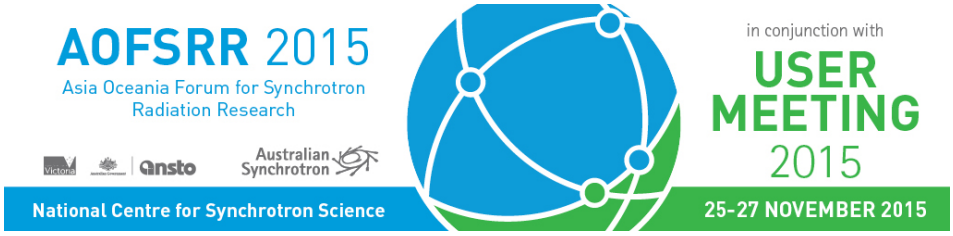

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Oxidative disintigration of greigite (Fe3S4): New insights from XAS

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Greigite (Fe3S4) is a ferrimagnetic iron sulfide mineral, containing both Fe(II) and Fe(III) centres. There is ongoing debate over the role of greigite in sedimentary settings, especially acid sulfate soils: its partially oxidised nature has traditionally been seen as indicative of a metastable intermediate in low temperature sulfide mineralization, however others have found greigite to be a distinct end-member that forms under partially oxic (or oscillating redox) conditions. From a thermodynamic perspective it should have limited stability with respect to pH and dissolved sulfur activity, yet has been identified in natural sediments of up to a few million years old.

The iron sulfides are an important sink and potential source for metals in contaminated environments. Understanding the oxidative transformation of greigite is vital for understanding contaminant release and sequestration.

We present a study into the oxidation of greigite under aqueous conditions. The effects of solution pH, Cl- and SO42- concentrations are examined with respect to transformation kinetics, mineralogy of the oxidation products, and the relationship between Fe and S oxidation (using X-ray absorption spectroscopy). The results of this study provide new insights into the role and longevity of greigite in natural sediments and will underpin new remediation strategies for acid sulfate soils, while also adding to our understanding of the geochemical cycling of Fe and S.

Keywords

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