Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.7221

Water to rock? Tufa formation for capture of contaminants in industrial waste leachate

MARTA KALABOVÁ[1], SUSAN ALISON CUMBERLAND[1], JOANNA RENSHAW[1] AND JOHN MACDONALD[2]

[1]University of Strathclyde

[2]University of Glasgow

Presenting Author: marta.kalabova@strath.ac.uk

"Anthropogenic" tufas (i.e. surface freshwater limestones) form as a result of $CaCO_3$ enrichment of drainage waters from the weathering of waste materials at industrial legacy sites. We investigate the potential for dissolved metal capture (and therefore legacy pollution remediation) through sorption and ion exchange by geochemical characterisation of anthropogenic tufas in Scotland.

Samples from stagnant and flowing tufa-precipitating waters, taken downstream, were analysed for alkalinity by titration with 0.5N H_2SO_4. Elemental analysis of water and acid-digested tufa samples and source waste (paper mill spoil, unknown colliery waste) was performed using ICP-OES. Mineralogy and internal structures will be determined using SEM and XRD. Hyperalkaline (pH>10) leachate from steel slag, paper mill spoil and suspect colliery waste sites incorporates atmospheric CO_2 during tufa mineralisation, resulting in a downstream decrease in pH accompanied by a sharp drop in alkalinity, conductivity (within pH change from >13 to 9-10), metals (Ca, Mg, Sr, Na, K, Mn) and S, Cl and NO_2/NO_3.

A decrease in dissolved metal concentrations was coincident with secondary mineralisation occuring in the drainage outflow immediately adjacent to the waste deposits. This proccess could reduce contaminant transport to the wider environment. Moreover, the rapid drop in solution conductivity in the hyperalkaline leachates indicates that contaminant-capturing mineralisation largely occurs within the highest pH range (i.e. 10-13). Understanding these unusual geochemistry changes and mineralisation dynamics is crucial to assess contaminant capture potential in such settings and application to different industrial waste types for material reuse [1] and planning of waste handling and depository design in operating industries.

[1]. Riley, A.L.*, et al.*, 2020. **219**: p. 106630 DOI: https://doi.org/10.1016/j.gexplo.2020.106630.