Mobility and fate of metals in high pH steel slag drainage waters

C.M.HOLDSWORTH[1]* AND J. MACDONALD[1]

[1]School of Geographical & Earth Sciences, Gregory Building, 27 Lilybank Gardens, University of Glasgow, G12 8QQ, UK

(*correspondence: c.holdsworth.1@research.gla.ac.uk)

Worldwide steel-making produces 170-250 million tonnes of slag material every year [1]. Steel slag is commonly disgarded in heaps resulting in the weathering and subsequent dissolution of lime (CaO) and metallic components (e.g. V and Cr) of the slag, producing alkaline residues, waters and leachates [2, 3].

Environmental challenges such as the mobility and fate of metals in steel slag drainage systems are examined using the site of the Consett steel works in County Durham, England, as a case study example. Consideration is also given to the potential opportunities for the utilisation of steel slag-derived alkaline residues in the future [4, 5].

Figure 1: Alkaline leachates found at Consett, England.

Methodology

Laser Ablation Inductively-Coupled Plasma Mass Spectrometry (LA-ICP-MS) and ICP-MS analyses of steel slag, surface water and alkaline leachate samples has been performed, as has Clumped Isotope Palaeothermometry of alkaline leachates, to examine what controls metal mobility and fate in these environments. Quantification of the distribution and concentrations of metals at this site assesses local environmental hazards, whilst additionally examining opportunities for future utilisation of steel slag residues.

[1] USGS (2015) *Iron and Steel Slag Statistics and Information, Minerals Information*. Minerals Information. [2] Mayes *et al.* (2008) *Water Air and Soil Pollution* **195**, 35-50. [3] Riley and Mayes (2015) *Environ Monit Assess* **187**: 463. [4] Deutz *et al.* (2017) *Geoforum* **85**, 336-344. [5] Renforth *et al.* (2009) *Applied Geochemistry* **24**, 1757-1764.