Mobility of trace metals from a peri-urban informal e-waste recycling site in an arid environment

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Introduction

Electronic waste (e-waste) is a fast growing global waste stream [1]. Informal e-waste processing can involve burning discarded electronics to extract valuable metals; a growing and poorly described anthropogenic source of trace metals in the environment [1]. We describe trace metal mobility from a peri-urban, informal e-waste burn site in a semi-arid environment. The mobility of metal toxicants released by informal e-waste processing in arid environments, has not been previously described and differs from wet environments [2]. This has implications for the health of populations living nearby.

Results

X-ray diffractometry (XRD) shows that samples are mineralogically consistent across the burn site and dominated by calcite and kaolinite minerals. Scanning electron microscopy (SEM) in backscatter mode shows that the trace metals are concentrated in the smallest size particles (Figure 1). Dynamic light scattering (DLS) shows colloidal size particles in water from a nearby well. ICP-AES of a sample of this well water shows mobile Pb, Fe and Mn below instrument detection limits (0.1, 0.1, and 0.01 ppm, respectively); Cu at 0.0785 ppm (~1/20 the U.S. EPA standard: 1.3 ppm), and Zn at 0.0441 ppm. Further testing by ICP-MS is planned to better understand the release of heavy metals into local water sources.

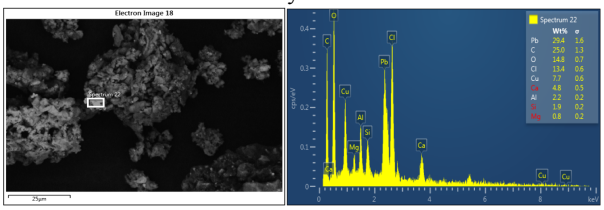

Figure 1. Backscatter SEM results showing a small particle, part of a larger calcite aggregate, with high concentrations of Pb and Cu.

Discussion

In the peri-urban e-waste burn site that we have investigated, initial results indicate that human health risks are likely controlled by direct contact with the burn site itself. In this semi-arid, carbonate dominated geochemical environment, direct heavy metal release (e.g., dissolution) from informally processed e-waste materials is limited.

[1] Robinson (2009) *Sci. Tot. Env.* **408**, 183-191. [2] Song and Li (2014) *Waste Manag.* **34**, 2587-2594.