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# Trace element speciation and incorporation in iron oxides within mineral processing residues

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Iron oxides make up a large proportion of mineral processing residues and play an important role in hosting trace elements through either surface adsorption or isomorphous substitution. Mineral processing residues can contain elevated concentrations of trace metals such as As, Cr, Mo, V and Zn, most likely associated with iron oxides, and which pose challenges to successful remediation. Therefore, understanding the fundamental mechanisms of incorporation of these trace metals within iron oxides is of importance for understanding their speciation and mobility in residues throughout the remediation process. The present study investigated the incorporation of single and multiple metals (Al, As, Cr, Mo, V and Zn) into synthetic goethites and hematites. Element concentrations were quantified by a mixed acid digest followed by Inductively Coupled Plasma Optical Emission Spectroscopy. Structures were characterised by synchrotron X-ray diffraction, and changes in unit-cell dimensions upon substitution of trace metals were quantified using the Rietveld method in TOPAS. The speciation of redox-sensitive substituents was characterised by X-ray Absorption Near Edge Spectroscopy. Preferential incorporation of trace elements was observed, and the incorporation of metals was shown to alter unit cell dimensions of the synthetic iron oxides. The presence of metals also influenced crystal morphology, surface properties and chemical stability of the iron oxides. Results from this work are expected to provide insights into the structure, behaviour, and properties of iron oxides within mineral processing residues and the broader environment.

## Speakers Gender

Female

## Travel Funding

Yes

## Level of Expertise

Student

## Do yo wish to take part in the poster slam

Yes

**Primary author(s) :** SCULLETT-DEAN, Grace (University of Western Australia)

**Co-author(s) :** SANTINI, Talitha (University of Western Australia); HAMILTON, Jessica (Australian Synchrotron (ANSTO)); REPINA, Oxana

**Presenter(s) :** SCULLETT-DEAN, Grace (University of Western Australia)

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