

# **Experimental insights into the mobility of metals in sedimentary basin-hosted copper systems**

JULIA WOITISCHEK, JAMIE J WILKINSON AND  
MATTHEW D. JACKSON

Imperial College London

Presenting Author: [jwoitisc@ic.ac.uk](mailto:jwoitisc@ic.ac.uk)

Sedimentary basin-hosted copper deposits are critical to the energy transition because they contain >23% of the world's discovered copper (Brown, 2007) and many other metals that may attain ore grades including cobalt and vanadium. Understanding the mobility of copper and other metals in these basins is of importance for interpreting ore formation processes and developing novel exploration tools. It has been suggested that the iron oxide coatings in red bed sandstones are an important source of metals that can be mobilised and transported by groundwater flow (e.g. Parnell et al., 2021). It is known that copper adsorbs strongly on iron oxides under oxidising conditions but that under reduced conditions it forms strong chloride complexes in solution (Rose and Bianchi-Mosquera, 1993). However, these previous studies have not considered flow effects, the impact of highly acidic solutions or higher temperatures, with experiments carried out at temperature below 100 °C.

Here, we report new experiments to determine the mobility of copper in natural brines in contact with red-bed sandstones, under both static and dynamic (flow through) conditions relevant to mobilization in basins. We have investigated critical parameters for ore formation including initial copper content and chemical and physical properties of red-bed sandstones, brine- to pore-volume ratio used in experiments, brine composition as well as pH, and temperatures up to 200 °C.

## References:

- Brown, A.C., 2007. World-class sediment-hosted stratiform copper deposits: Characteristics, genetic concepts and metallogenesis. *Australian Journal of Earth Sciences* 44:3, 317-328.
- Parnell, J., Wang, X., Raab, A., Feldmann, J., Brolly, C., Michie, R., Armstrong, J., 2021. Metal Flux from Dissolution of Iron Oxide Grain Coatings in Sandstones. *Geofluids*, 5513490.
- Rose, A.W., Bianchi-Mosquera, G.C., 1993. Adsorption of Cu, Pb, Zn, Co, Ni and Ag on Goethite and Hematite: A Control on Metal Mobilization from Red Beds into Stratiform Copper Deposits. *Economic Geology* 88(5), 1226-1236.