

## SCIENTIFIC COMMUNICATIONS

---

---

### *REFINEMENTS FOR FOOTWALL RED-BED DIAGENESIS IN THE SEDIMENT-HOSTED STRATIFORM COPPER DEPOSITS MODEL*

ALEX C. BROWN<sup>†</sup>

*Department of Civil, Geological and Mining Engineering, École Polytechnique de Montréal  
P.O. Box 6079, Sta. Centre-Ville, Montreal, Quebec, Canada H3C 3A7*

#### **Abstract**

The emplacement of copper in sediment-hosted stratiform copper deposits requires the circulation of a low-temperature chloride-rich brine in rift-filling footwall red beds, probably driven by meteoric recharge in adjacent highlands. The descending oxygen-rich meteoric water may become saline (probably by leaching of footwall evaporites or possibly by mixing with brines draining down from contemporaneous evaporite pans) and evolve toward a moderately oxidized brine as oxygen is consumed during the diagenetic reddening of the initially nonred coarse-grained clastic rift sediments. Under these conditions, the pore solution attains its maximum ability to leach and transport trace amounts of copper from the red beds. Sediment-hosted stratiform copper deposits may form where the brine crosses a redox boundary into reduced sulfide-rich gray beds. With further consumption of oxygen during reddening, the brine may become highly reduced and able to take iron into solution, possibly explaining syngene sediment-hosted stratiform copper iron-oxide alterations and deposits. The timing of copper deposition is clearly linked to the diagenetic reddening of immature footwall sediments in rift basins, a process considered to extend over millions of years.

<sup>†</sup>E-mail: acbrown@polymtl.ca