

# Reconstruction of primary oceanic signatures from hypogene- and supergene-altered banded iron formations: the Weld Range BIF

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Chemical sediments, such as banded iron formations (BIFs), are robust ancient seawater proxies due to their ability to capture oceanic REE signatures through time - as supported through an array of REE ratios (i.e.,  $Nd_{CN}/Yb_{CN} > 1$ , where  $CN$  refers to chondrite-normalised) and oceanic REE trends (i.e., the W-type tetrad effect). Current research on paleoproxies is limited to unaltered units due to potential geochemical disturbance from secondary alteration events. However, it is important to differentiate the effects of overprinting on the bulk-rock geochemistry versus the fraction-specific geochemistry, when presented with various mineralogical fractions. Regarding BIF, three main mineralogical fractions are commonly recognised: the carbonate fraction (i.e., siderite), the Fe oxide fraction (i.e., magnetite, hematite, and goethite) and the silicate fraction (i.e., quartz). Thus, through sequential extractions [1], each mineralogical fraction can be targeted via specific laboratory conditions and reagents (i.e., sodium acetate, ammonium oxalate and HF-HNO<sub>3</sub>, respectively) and analysed for major and trace element and potential isotopic compositions. This study highlights fraction specific analysis of the ca. 2.7 Ga Weld Range BIF, Yilgarn Craton, Western Australia, where least-altered to progressively hypogene- and supergene-altered BIF units are apparent. Coupled with existing knowledge about the BIF genesis [2], the geochemistry from the sequential extractions determined that the silicate fraction provided robust primary oceanic signatures (i.e., where  $Nd_{CN}/Yb_{CN}$  values  $> 1$  and the W-type tetrad effect was apparent), reflecting the primary nature of the silicates. Although some samples did demonstrate preservation of seawater characteristics in the carbonate and Fe oxide fractions (i.e.,  $Nd_{CN}/Yb_{CN} > 1$  and W-type tetrad effect), this was instead considered to be reflective of the seawater mixing component from secondary alteration fluids rather than primary oceanic signatures. Therefore, this study has concluded that altered chemical sediments, namely BIF, can serve as a sufficient paleo proxy for reconstructing ancient seawater chemistry, provided that an undisturbed mineralogical fraction is available.

[1] Oonk, Tsikos, Mason, Henkel, Staubwasser, Fryer, Poulton & Williams (2017) *Chemical Geology* 474, 17-32

[2] Duuring, Hagemann, Banks & Schindler (2018) *Ore*