Pyrite trace element halos to northern Australian sediment-hosted Zn-Pb-Ag deposits

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Broad primary geochemical dispersion halos are a characteristic of northern Australian Proterozoic (sedex) Zn-Pb-Ag deposits [1]. Within these halos, pyrite is abundant in host rocks proximal to the deposits and present in smaller (often trace) amounts in more distal areas. Much of this sedimentary pyrite is thought to form at or near the sediment-water interface in an environment influenced by ore-forming fluids. Hence, ore-related trace elements within this pyrite may have the potential to provide vectors to the ore or help in delineateing mineralised from barren systems.

Here we report several hundred new pyrite trace element analyses from three major Zn-Pb-Ag deposits (McArthur River, Lady Loretta, Mount Isa), the Bluebush stratabound Zn prospect and their host rocks. Laser ablation-ICPMS was used to measure 25 trace and minor elements using beam sizes ranging from eight to forty microns. Over 95% of all pyrite analysed contained >0.10 wt% of trace elements, of which, Co, Ni, Cu, Zn, As, Sb, Ba, Tl, Pb, Mn, Mo, Ag, Bi and Sn are found in abundances significantly greater than detection limits. At McArthur River the host sediments contain no significant levels of Cu, Co, Ni, Pb, Zn. Concentrations of Co, Cu, Ni, Tl and Zn are often significantly elevated at the orebody and hangingwall equivalent stratigraphy. As, Ba, Mo, Sb, Sn are slightly elevated at the orebody equivalent stratigraphy. Spatial distribution patterns for many trace elements are erratic. Lateral changes in chalcophile trace elements do not yield simple vectors to mineralization.

In conclusion, the origin of trace elements in sedimentary pyrite in Australian palaeoproterozoic basins probably reflect the complex interplay of hydrothermal and hydrogenous metal inputs and the rate and nature of pyrite formation processes.

References

[1] Large R.R., Bull S.R. and McGoldrick P.J. (2000) *JGeochem Exploration* **68,** 105-126.