Re-Os isotope and trace elements study of black shales and nodular pyrites associated with massive sulphides in the Nimbus VHMS System, Western Australia.

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The Neoarchean Nimbus deposit is located near the margin of the Kurnalpi rift zone in the Eastern Goldfields Superterrane, Yilgarn Craton, Western Australia. It is a shallow-water, low-temperature VHMS system [1]. The host stratigraphy comprises a package of volcanic rocks of dacitic composition, lesser basalt, black shales, volcanic sandstones/siltstones and polymitic conglomerates with black shale matrix containing sedimentary nodular pyrites.

Trace element (TE) contents of sedimentary pyrite can be used as a proxy for seawater chemistry. Sedimentary pyrites were distinguished from later pyrite forms based on (a) texture of pyrite (e.g. colloform, zoned nodules) and (b) Co/Ni ratio of pyrite <2 [2].

The nodular pyrites show a general Cu enrichment linked to a Co depletion downhole. Mo content fit the temporal trend for sedimentary pyrites [2] and has a positive correlation with Co/(Co+As+Ni) ratios. TE variability in pyrites reflects change in the composition of the water column possibly caused by exhalation from the VHMS feeder zone.

Black shales and nodular pyrites both reflect the seawater $^{187}Os/^{188}Os$ at the time of deposition. The Re-Os dating of black shales and their nodular pyrites in Archean sequences allow for better spread due to the range in Re/Os ratios (from 7 to 25 in our case), increasing the accuracy and precision of an isochron age. Preliminary results yield a deposition age of ca. 2.7 Ga, synchronous to the magmatic age obtained by U-Pb zircon dating of ore-hosting dacites [1].

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