

**Supplementary Material for: Sedimentary pyrite: A window into the microbial past**

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**Sample Information:****Sample PEN-1**

Locality: 30 km north of Norseman, Western Australia, diamond drill core from Anaconda Minerals.

Lithology: Carbonaceous shale with flattened pyrite concretions (a few mm to several cm in size).

Geology/Stratigraphy: Norseman-Wiluna belt of the Eastern Goldfields Province of the Yilgarn Block (Phillips et al., 1996). Geology also described by Gemuts and Theron (1975). The core samples come from their Sequence 4, and are equivalent to the Black Flag Beds of Woodall (1965). The age of these strata is estimated to be  $2681 \pm 5$  Ma (Nelson, 1997).

**References:**

- Gemuts, I., and Theron, A., 1975, The Archean between Coolgardie and Norseman - stratigraphy and mineralization. In: Knight, C.L., (ed.), Economic Geology of Australia and Papua New Guinea, I Metals, Australasian Institute of Mining and Metallurgy, p. 66-74.
- Nelson, D.R., 1997, Evolution of the Archean granite-greenstone terranes of the Eastern Goldfields. Western Australia: SHRIMP U-Pb zircon constraints. Precambrian Research, v. 83, p. 57-81.
- Phillips, N.G., Groves, D.I., and Kerrich, R., 1996, Factors in the formation of the giant Kalgoorlie gold deposit. Ore Geology Review, v. 10, p. 295-317.
- Woodall, R., 1965, Structure of the Kalgoorlie Goldfield. In: McAndrew, J. (ed.) Geology of Australian Ore Deposits, 8<sup>th</sup> Commonwealth Mining & Metallurgical Congress: Melbourne, p. 71-79.

**Sample I-1**

Locality: Southwestern India, Kalamawadi village, Kolhapur District, southern Maharashtra (location given in Sarkar et al., 1997).

Lithology: Sandstone interbedded with carbonaceous shale.

Geology/Stratigraphy: Kaladgi Supergroup (Middle to Late Proterozoic), outcrop at Dudhganga dam site.

Sulfur Isotopes: average for 10 measurements is -8 permill  $\delta^{34}\text{S}$

**References:**

- Sarkar, P.K., Soman, G.R., and Kale, M.G., 1997, Occurrence of pyritized oolites in the Kaladgi Supergroup (Middle to Late Proterozoic) sediments from the Kalamawadi area, Kolhapur District, Maharashtra. Indian Minerals, v. 51, p. 137-148.

**Sample 86BC**

Locality: Ruby Creek, Waterton National Park, British Columbia, Canada (location given in Binda et al., 1985).

Lithology: Interbedded sandstone and shale.

Geology/Stratigraphy: Basal Siyeh Formation, Purcell Supergroup, Middle Proterozoic.

Sulfur Isotopes: variable, ion probe measurements give a range of 3-11 permill  $\delta^{34}\text{S}$ . Has late diagenetic overprint, inner portions of grains with lighter values.

References:

Binda, P.L., Koopman, H.T., and Schwann, P.L., 1985, Sulphide ooids from the Helikian Siyeh Formation of Alberta: *Mineralium Deposita*, v. 20, p. 43-49.

**Sample SWC-1**

Locality: Saskatchewan, Canada, diamond drill core (Socony Western Carievale 16-4-3-32; Paterson, 1971). Samples are the same as described in Schieber, 2002 (more details in Binda and Simpson, 1989).

Lithology: Interbedded quartzose sandstone (bioturbated) and shale.

Geology/Stratigraphy: Black Island Member, Winnipeg Formation, Middle Ordovician.

Sulfur Isotopes: average for 5 measurements is -18 permill  $\delta^{34}\text{S}$

References:

Binda, P.L., and Simpson, E.L., 1989, Petrography of sulphide-coated grains from the Ordovician Winnipeg Formation, Saskatchewan, Canada. *European Journal of Mineralogy*, v. 1, p. 439-453.

Paterson, D.F., 1971, The stratigraphy of the Winnipeg Formation: Report No. 140, Saskatchewan Department of Mineral Resources, p. 57pp.

Vigrass, L.W., 1971, Depositional framework of the Winnipeg Formation in Manitoba and eastern Saskatchewan: The Geological Association of Canada, Special Paper, v. 9, p. 225-234.

Schieber, J. 2002, The Role of an Organic Slime Matrix in the Formation of Pyritized Burrow Trails and Pyrite Concretions. *Palaos*, v. 17, p. 104-109.

**Sample 8/5/95-5**

Locality: Hurricane Bridge road cut, DeKalb Cty., Tennessee. On Tennessee Hwy 56, 1.2 miles north of bridge across Center Hill Reservoir (locality 69 of Conant and Swanson, 1961).

Lithology: Black shale.

Geology/Stratigraphy: Chattanooga Shale, Middle Frasnian, Upper Devonian.

Sulfur Isotopes: average for 5 measurements is -14.9 permill  $\delta^{34}\text{S}$

References:

Conant, L.C., and Swanson, V.E., 1961, Chattanooga Shale and related rocks of central Tennessee and nearby areas, United States Geological Survey Professional Paper 357, 91p.

Schieber, J., 1998, Sedimentary features indicating erosion, condensation, and hiatuses in the Chattanooga Shale of central Tennessee: relevance for the sedimentary and stratigraphic evolution of an important black shale succession: in J. Schieber, W. Zimmerle, and P. Sethi (eds.), *Mudstones and Shales (vol. 1): Basin Studies, Sedimentology and Paleontology*, Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, p. 297-299.

**Sample 11/11/89-10**

Locality: Dotternhausen cement quarry, Dotternhausen, Baden-Württemberg, Germany (locality described in Riegraf et al., 1984).

Lithology: Black shale.

Geology/Stratigraphy: Posidonia Shale, Toarcian, Jurassic.

References:

Riegraf, W., et al., 1984, Der Posidonienschiefer – Cephalopodenfauna, Biostratigraphie und Fazies des südwestdeutschen Untertoarcium (Lias ε). F. Enke, Stuttgart.