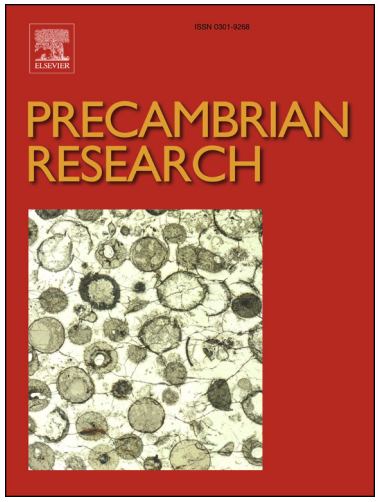

Organic remains in late Palaeoproterozoic granular iron formations and implications for the origin of granules

Matthew S Dodd, Dominic Papineau, Zhenbing She, Marilyn L. Fogel, Sandra Nederbragt, Franco Pirajno

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Organic remains in late Palaeoproterozoic granular iron formations and implications for the origin of granules

Matthew S Dodd[a,b], Dominic Papineau[a,b], Zhenbing She[c], Marilyn L. Fogel[d], Sandra Nederbragt[e], Franco Pirajno[f],

[a]London Centre for Nanotechnology, 17-19 Gordon Street, University College London, London, WC1H 0AH, UK.
[b]Department of Earth Sciences, University College London, London, WC1E 6BT, UK.
[c]School of Earth Sciences & State Key Laboratory of Biogeology and Environmental Biology, China University of Geosciences, Wuhan, China.
[d]Department of Earth Sciences, University of California, Riverside 900 University Ave. Riverside, CA 92521, USA
[e]School of Earth and Ocean Sciences, Cardiff Univeristy, Cardiff, CF10 3AT, UK.
[f]Centre for Exploration Targeting, The University of Western Australia, 35 Stirling Highway, Crawley, WA 6009 Australia

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Toward the end of the Palaeoproterozoic era, over 10^9 billion tonnes of banded (BIF) and granular (GIF) iron formations were deposited on continental platforms. Granules in iron formations are typically sub-spherical structures 0.2 to 10 mm in size, whereas concretions are larger than 10mm. Both types of spheroids are preserved throughout the sedimentological record. Their formation has typically been interpreted to originate from reworked Fe-rich sediments in high-energy, wave-agitated, shallow-marine environments. New evidence from six different late Palaeoproterozoic granular iron formations (GIF), however, suggests that some granules are the result of diagenetic reactions, in addition to other features driven by microbial processes and mechanical movements. Characteristic coarse grain interiors and septarian-type cracks inside granules, akin to those features in decimetre- to meter-size concretions, are interpreted as dessication features from hydrated diagenetic environments where sulphate and/ or ferric iron were reduced while organic matter (OM) was oxidised inside granules. Those granules derived from sulphate reduction preserve diagenetic pyrite rims, whereas those formed via ferric iron reduction preserve diagenetic magnetite along their rims. Other diagenetic minerals including apatite mixed with OM, and various carbonate phases are commonly preserved within granules. Combined with systematically ^{13}C-