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In situ pyrite chemistry from the mid-Proterozoic Barney Creek Formation and Teena Zn deposit

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The mid-Proterozoic Barney Creek Formation (McArthur Basin, Australia) has an exceptional endowment of clastic dominant (CD-type) massive sulfide zinc deposits together with some of the most well-preserved sedimentary rocks of Precambrian age. In the Teena subbasin, which hosts the most recently discovered CD-type deposit, high-grade sulfide mineralization has a complex sulfide paragenesis and formed during burial diagenesis within a transgressive depositional sequence. Reflected light microscopy and back scatter electron imaging has been used to establish key paragenetic relationships between the major sulfide phases. The trace element composition of pre- and syn-mineralization pyrite has been evaluated using electron probe microanalysis (EPMA) and *in situ* laser ablation inductively coupled mass spectrometry (LA-ICP-MS). An element ratio has been identified that differentiates between diagenetic and hydrothermal end member pyrite compositions in the Teena subbasin. More broadly, the element ratio derived from pyrite analyses from the Teena subbasin should be used for discriminating between hydrothermal and diagenetic end-members in samples from other sedimentary basins from the geological record. When applied to a larger pyrite chemistry dataset from the literature [1], the element ratio is relatively invariant; however, there are a subset of samples that were obtained from exploration drill-holes that intersected sulfide mineralization and that preserve high values. This indicates that the hydrothermal anomalism preserved in the hangingwall stratigraphy in the Teena subbasin could be a more general feature of hydrothermal activity in sedimentary basins, which necessitates careful screening of all pyritic samples obtained from exploration drill-holes.

Large, Halpin, Danyushevsky, Maslennikov, Bull, Long, Gregory, Lounejeva, Lyons, Sack, McGoldrick and Calver (2014) *Earth and Planetary Science Letters* 389, 209–220.