

LITHOGEOCHEMISTRY OF PEGMATITES AT BROKEN HILL: AN EXPLORATION VECTOR TO MINERALISATION

C.E. Torrey^{1}, G.M. Coianiz², J.A. Fitzherbert³, P.L. Blevin⁴*

Silver City Minerals Limited, chris.torrey@silvercityminerals.com.au¹; Exploris Pty Ltd, glenn@exploris.com.au²; Geological Survey of New South Wales, joel.fitzherbert@industry.nsw.gov.au³, Geological Survey of New South Wales, phil.blevin@industry.nsw.gov.au⁴

Pegmatites hosted in granulite and upper amphibolite facies metamorphic rocks are leucogranites, quartz-feldspar-mica or feldspar-rich pegmatites. These locally form large, sill-like, largely stratabound complexes within the lower part of the Willyama Supergroup. They are interpreted to have formed during anatexis and considered to be mostly in situ.

Those hosted in lower grade amphibolite and greenschist facies rocks are feldspar poor and quartz-muscovite rich, with tourmaline on their margins and as replacements of the surrounding protolith. They are volumetrically smaller than anatectic pegmatites and intrude and alter psammopelitic sequences in the upper parts of the Willyama Supergroup.

Data suggests a geochemical continuum from poorly evolved pegmatites hosted in high grade metamorphic rocks, lower in the stratigraphy, to more highly evolved types hosted in lower grade metamorphic rocks located in the upper parts of the stratigraphy.

Economic element content is similarly divided into two broad end-members. High grade metamorphic rocks host elevated Pb-Zn-Ag-Mn whereas lower grade metamorphic rocks host Sn-W mineralisation and elevated incompatible elements; Li-Nb-Cs-Rb-Tl-Ga-Ta.

We attribute elevated base metals in anatectic pegmatites to the enriched nature of those elements in the host protolith; the Broken Hill Group, the primary host to the Broken Hill Pb-Zn-Ag deposits and numerous BHT occurrences. In contrast, we attribute the Sn-W and incompatible element-enriched pegmatites to fractionation processes.

Exploration using systematic pegmatite geochemistry has the potential to enable vectoring toward buried BHT deposits in high grade metamorphic rocks. Similarly, the potential for Sn-W deposits and/or LCT (lithium-caesium-tantalum)-bearing pegmatite can be assessed in lower grade rock.