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Classification, mineralogical and geochemical variations in pegmatites of the Cape Cross –Uis pegmatite belt, Namibia.

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The Pan African Damara Orogen, Namibia, is host to a variety of mineral deposits which include pegmatite hosted lithium, tin, niobium-tantalum, uranium, and semi-precious stones (Miller, 1983[3]; Diehl, 1993[2]; Ashworth, 2013[1]). This paper is focussed on examining syn- and post-orogenic pegmatites (~490 Ma; mineralised and barren) of the Cape Cross–Uis pegmatite belt, to understand and give insight into mineralisation controls and pegmatite evolution. The Cape Cross–Uis pegmatite belt is one of ten narrow regional pegmatite belts, trending parallel to the orogen and lies within the Northern and South Kaoko Zones of the tectonostratigraphic zones of the Damara Orogen (Miller, 1983[3]). Within the belt, 3 major pegmatite swarms have been identified (Diehl, 1993[2]); the Strathmore, Karlowa and Uis Swarms. These swarms include cassiterite- and tantalite-bearing, unzoned, Uis-type tin pegmatites, and zoned lithium-beryllium pegmatites, barren pegmatites and weakly zoned tourmaline-bearing, intragranitic pegmatites (groups 1, 2, 3 and 4 respectively)

Field mapping evidence shows that pegmatites intrude with a NNE trend, in line with the regional structural fabric, along fold axes and bedding plane discontinuities. Pegmatites are variable in shape and size but are generally elongate and stock-work like in form and range from 10 – 300 m in length. Thickness also varies from about 1–70 m. Whole-rock major and trace element data has been acquired for pegmatites and granite and metasediment host rocks. Fine grained border zones of pegmatites and later stage greisen and albatised zones/pods were analysed to attain a possible chemical change between initial crystallisation and late stage crystallisation and fluid interaction. Granites and group 4 pegmatites show similar geochemical characteristics, such as elevated TiO_2, Ba, Y, Th, U, and total REE values compared to negligible amounts (< 10 ppm) in other pegmatite groups. Metasediment hosted pegmatites (group 1 – 3) show enrichment compared to granites and group 1 pegmatites in most other trace element values such as K_2O, Ta, Sn, Cs, Rb, Nb and peraluminousity. Geochemical evidence suggests that metasediment hosted pegmatites do no share a parent daughter relationship with either Salem-type or Red/Grey granites. Metasediment host rock interaction is evident within the pegmatite belt. Microliths of tourmaline and a bleaching of host rocks is a result of this interaction and a large increase in the Sn, Ta, and Nb compositions of the host rock. Whether or not this can be attributed to pegmatite fluids remobilising Ta, Nb and Sn and concentrating them in greisenised areas (assimilation), is debatable. The reverse might be more plausible, where late stage fractionated pegmatitic fluids rich in Ta, Nb, and Sn, leeched into the host rocks, causing tourmalinisation and enriched ore values. Processes such as fractionation can be traced by whole-rock geochemistry as a definitive contributor to mineralisation and pegmatite evolution. Tantalite and cassiterite microprobe analyses are near completion.

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