

Geochemistry and Source of Sapphires from NE Tasmania, Australia

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Alluvium and colluvium in the Weldborough area, NE Tasmania, yield sapphire, zircon and spinel, corroded by magma and abraded by alluvial transport (McGee, 2005; Khin Zaw et al., submitted). Drainage patterns and inferred palaeodrainage indicate that the Weldborough basalts are the probable primary source. The Weldborough sapphires are blue (80%), yellow and green (20%) with rare pink sapphires. Microscopic and laser Raman identification revealed that the NE Tasmanian sapphires contain olivine, feldspar, spinel, zircon, molybdenite and Nb-Ta-rich phases as mineral inclusions. LA-ICPMS analysis indicates the sapphires have iron [2590 ppm (1560 – 4890ppm)], titanium [383 ppm (10 – 2410ppm)] gallium [258 ppm (121 - 409)] and tantalum [186 ppm (<1 – 2560ppm)] as the most abundant trace elements. Niobium, beryllium, magnesium, vanadium, chromium and tin are low level trace elements in the Weldborough sapphires. Beryllium, titanium, niobium and tantalum are enriched in the cores of the sapphires. The sapphires have O-isotope values of + 4.4 ‰ to + 6.3 ‰, indicating that they are in O-isotope equilibrium with rocks of mantle O-isotopic compositions. The Weldborough sapphires also contain primary CO2 liquid bearing fluid inclusions and they also imply that the sapphires were formed at upper mantle to lower crustal environments.