ISLAND ARC PICRITES FROM THE SOLOMON ISLANDS – ORIGIN BY MANTLE MATRIX COLLAPSE

A. Rohrbach (1), S. Schuth (1), C. Münker (1), C. Ballhaus (1)
(1) Institut für Mineralogie, Westfälische Wilhelms–Universität Münster, Corrensstr. 24, 48149 Münster, Germany (rohrbaa@uni–muenster.de)

The MgO enrichment in picrites is commonly explained by accumulation of liquidus olivine in a convecting magma chamber. Here we report results from subduction related picrites from the New Georgia archipelago (Solomon Islands) that were examined to derive the parental melt composition and to understand the wide range in MgO contents (13 to 30 wt.%). The New Georgia picrites cannot be explained by a simple cumulate assimilation model. The samples contain up to 40 vol.% olivine, calcic cpx, and chrome spinel as phenocrysts, set in a microcrystalline groundmass. There are two distinct populations of olivine, one with <0.12 wt.% CaO (low–Ca) and one with 0.18 to 0.34 wt.% CaO (high–Ca). The high–Ca olivines (Fo$_{84−92}$) are considered to be the equilibrium olivine phenocrysts of a basaltic to picritic melt. The low–Ca olivines (Fo$_{90−93.4}$) zone towards high–Ca compositions towards the rims and were obviously not in equilibrium with the melt at the time of crystal incorporation. Oxygen fugacities of the picrites calculated from Fe$^{3+}$ in chrome spinel are around FMQ+3.35. At this relative $fO_2$ the MgO content of the parent melt is constrained to 14.85 wt.% assuming $K_{D_{Fe^{3+}}^{Mg}}^{ol−liq}$ equilibrium (0.3) with the high–Ca olivines. The liquidus temperature of the melt [1] based on this MgO content is 1323°C, 60°C above the olivine–cpx Ca–exchange temperature [2]. The depth of melting is constrained to less than 60 km by the seismic depth of the Benioff zone. This is also supported by geochemistry [3] and the highly oxidized nature of the parent melt that favour the mantle wedge as the exclusive mantle source. The presence of picrites in the Solomon Islands is confined to the region above the active Woodlark spreading centre that is subducted beneath the arc. This extra heat source caused extensive melting and an eventual collapse of the mantle matrix, represented by the assimilated low–Ca olivines. The range in bulk