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GEOCHEMISTRY OF ULTRAMAFIC-MAFIC SUITS OF WAZIRISTAN OPHIOLITE COMPLEX (WOC): IMPLICATION FOR PETROGENESIS AND TECTONIC SETTING

RAHAM JALIL[1], OLIVIER ALARD[1], BRUCE SCHAEFER[1], LIAQAT ALI[2] AND MUHAMMAD SAJID[3]

[1]Macquarie University

[2]National Centre of Excellence in Geology, University of Peshawar

[3]Department of Geology, University of Peshawar

Presenting Author: rahamjalil123@gmail.com

The WOC that represents the suture zone between the Indo-Pakistan plate to the South-East and the Afghan microplate to the North-West, is primarly composed of serpentinised dunites and serpentinites, crosscutted by pyroxenites. Meta-basalts also occur along with diorites, and less abundant felsic rocks (plagiogranite). Whole rock XRF and trace element ICP-MS analyses have been undertaken in order to determine the degree of melt depletion and subsequent geochemical enrichment. Geochemically, the studied peridotites display high MgO values (36.4 – 38.6 wt%), very low Al_2O_3 (0.19 – 0.96 wt %) and total alkalis (Na_2O+K_2O) values (0.024 – 0.220 wt%), and extremely low TiO_2 values (0.001 – 0.017 wt %). These rcoks show relatively high Mg# (90.8-92.3) indicating that they have undergone a high degree of partial melting (>20 %). The meta-basalts show low to moderate MgO values (6.23 – 12.98 wt%), overall higher Al_2O_3 values (average = 11.90 wt %), low total alkali content (0.01 – 4.45 wt%),TiO_2 values (0.13 – 0.17 wt %) and lower Mg# values (47.89-68.07). These basalts plot in the boninite field implying their formation during subduction initiation. Their back-arc basin affinity is further confirmed by their trace elemenet abundances and fractionation.

The peridotites show extreme depletion in REE content ($0.03<\sigma REE_{CN}<0.6$), no marked HFSE anomalies and very low LILEs content. Relative to chondrite, the serpentinized peridotites reflect strong enrichments in light rare earth elements (LREE) relative to middle rare earth elements (MREE) i.e., ($1.94<La_N/Sm_N<16.9$) and a slight enrichment in LREE relative to heavy rare earth elements (HREE) i.e., $0.27<La_N/Yb_N<2.2$. Such a variation in REE inventory is commonly observed in fore-arc serpentinites and mantle wedge serpentinised peridotites formed in supra-subduction zone wherein the depleted peridotites are re-enriched by the fluids released from subducting slabs. The primitive mantle normalised patterns of the serpentinised peridotites are also marked by U-Th fractionation ($2.24<U_{PM}/Th_{PM}<44.3$) indicative of metasomatism in subduction zone environments.