Abstract No: 542 (Poster) *Engineering, Built Environment and Earth Sciences*

IDENTIFYING MINERAL DEPOSITS BY ANALYSING PLATINUM GROUP ELEMENTS, COPPER AND GOLD IN SRI LANKAN ROCKS

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Gold (Au), copper (Cu) and PGE (Re, Pd, Pt, Rh, Ru and Ir) are strongly partitioned into a sulfide melt if a magma become sulfide saturated. Thus, separation of an immiscible sulfide melt controls the subsequent chemical evolution of these calcophile elements. Abrupt depletions of PGE, Au and Cu suggest that a sulfide saturated melt has escaped from a specific rock unit and the escaped melt may form a hidden mineralized zone. In the present study, mafic meta-igneous rocks of the Highland Complex of Sri Lanka were explored using Au, Cu and PGEs for occurrence of calcophile element bearing mineral deposits.

The sampled mafic rocks were powdered and their whole-rock PGE concentrations were measured using an ICP-MS. The Ni-sulfide fire assay-isotope dilution method used 2–5 g of sample powder mixed with Ni, S, and sodium borax powder in a porcelain crucible. A mixed spike solution of PGE (^{105}Pd, ^{185}Re, ^{191}Ir, and ^{195}Pt) was added to the mixture and fused in a preheated furnace at 1,100 ºC for 30 min. After quenching, the Ni-sulfide beads were collected and dissolved in HCl. The solution was filtered and dried down to approximately 100 µl, then diluted with 2 % HNO_3 for analysis.

Our results show a bi-modal distribution of PGE in the studied rocks. A sample from Ampitiya contains the highest Au (7 ppb) while the highest Pd and Pt (11 and 13 ppb, respectively) were noted in a sample from Kotmale. The ratio of Au/Pd is regarded as an indicator of sulfide saturation in evolving magmas since Pd partitions preferentially into sulfide melt relative to Au rapidly increasing the Au/Pd ratio if a silicate melt becomes sulfide-saturated. The Au/Pd gradually increases with decreasing MgO in the analyzed samples and suggests variation of PGE and Cu by progressive segregation of an immiscible sulfide melt. However, the sample with the highest Au content does not have the highest Pd. This difference could be related to the higher compatibility of Pd compared to Cu and Au in immiscible sulfide melts.

Present data suggests sulfide saturation and segregation of immiscible sulfide melts from parental magmas and their association with the studied mafic meta-igneous rock suites. Thus, potential occurrence of calcophile-mineralized zones hidden within the Highland Complex of Sri Lanka cannot be ruled out.

Financial assistance given by University of Peradeniya (RG/2012/41/S) is acknowledged.