GEOCHEMISTRY OF THE PERMIAN PANJAL TRAPS FROM KASHMIR VALLEY, NORTH-WEST HIMALAYA, INDIA

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Abstract

Panjal Traps form high hillocks in Kashmir Valley. These volcanic rocks exposed at various places in Kashmir Valley show both columnar joints and pillow lava structures. Panjal volcanic rocks are mainly basaltic in composition; however, minor silicic volcanic rocks are also associated at a few places. In the present work samples from Aru section (Lidder valley) were studied with the aim of deciphering their petrogenesis and tectonic setting. Aru section samples show amygdular structures. Petrographic studies indicate plagioclase and pyroxenes with groundmass represented by microliths of these minerals and their alteration products. Occasional amphiboles are present in the studied samples. In the total alkalies vs SiO2 (TAS) diagram, all samples occupy the field of subalkaline-tholeiites. The studied samples show iron enrichment trend on AFM diagram (A = Na2O+K2O, FeO*/MgO = total iron as FeO, and M = MgO), fractional crystallisation trends for the early formed minerals olivine, plagioclase, pyroxenes are depicted by these samples on Harker variation diagrams. The relatively flat HREE pattern and low La/Yb ratio (<5.0), Nb/Y (~0.55) and Zr/Y (~6.5) ratios depicted by the studied basalts indicates that the mantle source was shallow <75km and likely to be a spinel-bearing lherzolite. The La/Sr vs Sm/Yb ratio plot suggests spinel peridotite as a probable source of the studied samples. Chondrite normalized rare earth element (REE) distribution patterns for the Aru samples show slight LREE enrichment relative to MREE [1.76<La/Gd<2.98] and HREE [2.42<(La/Yb),<4.79] with negligible negative Eu anomalies (0.86<Eu/Eu*<1.08) which indicates that the plagioclase was not a main fractionating phase. On PM normalized multi-element plots the studied samples do not show negative Nb anomaly which points towards their ocean basalt nature. Major element based tectonic setting discrimination diagrams such as [FeO-MgO-AI2O3 and TiO2-K2O-P2O5] also indicates that the studied samples are similar to ocean basalts. On Ti/Y vs Zr/Y diagram the studied samples plot in the field of plate margin basalt and on Ti-Zr-Y diagram they show ocean floor basalt characteristics. Further, on Nb-Y-Zr tectonic setting discrimination diagram the studied samples plot in E-MORB fields. Their E-MORB characteristics are also supported by Nb/Yb vs TiO2/Yb diagram. Hence, it is inferred that the studied Panjal Traps have originated under the plate margin tectonic setting having E-MORB geochemical characteristics.

Keywords: Basalts; E-MORB; Kashmir Valley; Petrogenesis; Tectonic setting