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Geochemistry of Lower Paleozoic Magmatism in the Eastern Albours

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Soltan-Meydan basaltic suite (SMBS) with more than 100 km long and about 1000 meter thickness is the most volcanic activity of the early Paleozoic in the eastern Albours' mountain which was named as one of the Paleozoic formation in the geology of Iran. SMBS is overlaid disconformably by Padeha sandstone (lower Devonian) and is also underlaid disconformably by sandstone of Shir-Gesht formation (Ordovician) therefore its stratigraphy position indicates the Silurian age. Post magmatism processes such as hydrothermal alteration and metasomatism affect the major and mobile trace element concentration hence they overlap with magmatism processes which result in a complicated geochemistry of SMBS.

The goal of the present research is to answer the following questions: a) the source melt of SMBS, b) the degree of partial melting of the source to generate SMBS primary magma, c) the evolving of the melt caused by fractional crystallization, d) the Tectono-magmatic environment of SMBS, and e) clarifying the role of post magmatism processes such as hydrothermal alteration in the geochemistry of this suite.

The petrography of SMBS consists of a range of basalt, Trachybasalt, basaltic Andesite and basaltic Trachyandesite. Because of aqueous environment of eruption, SMBS exhibits pillow lava structure - especially in the Khosheylaq area – which indicates extensive hydrothermal alteration. Chloritization is the main alteration process. Consequently Ferromagnesian minerals such as Pyroxene, Olivine and glassy groundmass change into Chlorite. Vesicles from degassing lava are observed at flow tops. Besides they have been filled by secondary minerals such as Chlorite, Calcite, Quartz, Prehnite and Pumpellyite all of which leads to Amygdale texture. It should bear in mind that Chlorite is the most frequency mineral in this process.

Immobile elements including HFS and REE are used to eliminate post magmatic effects. SMBS samples in Chondrite normalized spider diagrams unlike the MORB exhibit enrichment of incompatible elements and unlike the island arc basalt (IAB) represent any negative anomalies of Nb and Ta in its signature. Thus MORB type and IAB type magmatism are rejected. In these diagrams LREE show more enrichment than MREE and HREE. The SMBS samples in HFS discriminating diagrams of Zr/TiO2 vs. Nb/Y mainly plot in alkali basalt area a few of which plot in sub alkaline basalts area which are Tholeiitic basalt.

The SMBS plot within plate basalt (WPB) area in Ti, Zr, Y discrimination diagram. They plot above ΔNb line in Nb/Y vs. Zr/Y diagram which indicates mantle plume source. Two samples (A13 and 63) plot separately from others because of high SiO2. Therefore they shift to Rhyolite area in TAS diagram. These high SiO2 samples represent negative anomaly in Chondrite normalized pattern which may indicate crustal partial melting caused by the heat of head plume. Consequently they signal bimodal magmatism in SMBS.The decompression of ascend mantle plume might generate 5% fractional melting of primitive mantle (PM) termed SMBS primary magma.