Origin and magmatic evolution of the alkaline extrusive rocks of Neogene from Nehbandan-Assagie region, eastern Iran

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Abstract: The alkaline extrusive rocks of Neogene from Nehbandan-Assagie region, eastern Iran, include basanite, hawaiite, mugearite and benmoreite. Relatively low Ni and Cr contents and Mg-numbers of basanites are indicative of olivine and clinopyroxene fractionation from their relevant primary magma. Decreasing of CaO, TiO₂, FeO₉, HREEs and MREEs with increasing SiO₂ indicate fractional crystallization of amphibole, clinopyroxene and Fe-Ti oxides. In basanites, hawaiites and mugearites with less than 52 wt.% of SiO₂, high Nb/U ratio and lack of Nb and Ta negative anomalies are evidence for the low effect of crustal assimilation, if any, to the chemical composition of these rocks. In more-fractionated rocks, like some mugearites and benmoreites, crustal contamination is inferred from chemical characteristics and existence of quartz xenocrysts. The trace element concentrations and ratios of these rocks are similar to those of alkaline oceanic island basalts (OIB). (Tb/Yb)N more than 1.80 and (Dy/Yb)N more than 1.60 of these rocks are considered here as their generation after partial melting of an asthenospheric mantle in the garnet stability field. In addition, geochemical differences between the basanites and the other rocks are due to formation of their magmas, respectively, after 5-7 percent and 2 percent partial melting of a garnet lherzolite source.

Keywords: alkaline; basanite; hawaiite; mugearite; benmoreite; Sistan Suture Zone.

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