Petrogenesis and mantle source characteristics of alkaline lavas in NW Ahar, NW Iran

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Alkaline lavas in NW Ahar have been analysed for major and trace elements and Sr and Nd isotope composition. These rocks are enriched in the large ion lithophile elements (LILE, e.g., Rb, Ba, Sr) and light rare earth elements (LREE), depleted in the high field strength elements (HFSE, e.g., Nb, Ti, P), and possess uniform initial $^{87}Sr/^{86}Sr$ (0.704463–0.704921) but relatively wide ranges of Nd [εNd (T)=0.4-2.8], implying a magma origin from enriched mantle sources. CaO/Al2O3, La/Sm ratios and Ba and Zr versus Th suggest that fractional crystallization was a major process during the evolution of magmas. Rb/Zr, Th/Yb and Ta/Yb ratios as well as AFC modeling, isotopic data and microscopic evidence indicates that crustal contamination accompanied by the fractional crystallization played an important role in petrogenesis of the trachyandesites. Alkali basalts with high $^{143}Nd/^{144}Nd$ ratio, low $^{87}Sr/^{86}Sr$ ratio and high MgO, Ni and Cr contents indicate that they crystallized from relatively primitive magmas. REE modelling and Trace element ratios indicate that the alkali baslats were derived by small degrees (1-3%) of partial melting from the spinel lherzolite. According to geothermobarometry measurements, crystallization temperature and pressure for the alkali basalts estimated 1170° C to 1270° C and 8kbar respectively.