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Geochemistry of Gabbroic and Diabasic sills in the Central Alborz

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There are several gabbroic and diabasic sills, in the central Alborz, which represent more than 50 meter thickness. These intrusive rocks are overlaid by Khosh-Yeylagh formation and underlain by Mobarak formation. So their stratigraphic interval demonstrates an epoch between late Devonian and early Mississippian. These intrusive sills spread through the Alborz structure zone between two main Iranian geological sedimentary formations as a key bed and may indicate an extensional zone in Iranian Paleozoic platform. Due to Hercynian orogenic movement which happend in the late Paleozoic era in Europe but it acted as extension movements in Iranian platform.
Petrographically, these intrusive sills consist of gabbro, gabbroic diorite, monzodiorite, and monzogabbro. Their major minerals are plagioclase, clinopyroxene and olivine plus accessory minerals such as apatite, ilmenite, and spinel. Most of samples display deeply alteration and secondary phases such as amphibole, chlorite, calcite, epidote, and zoisite. Texturally, these rocks show variety of grain size range of coarse grain gabbroic rocks to hypabyssal fine grain diabasic once.
From geochemical point of view, all of the rock samples on TAS diagram plot in sub-alkaline field. Due to high alteration, samples plot on Nb/Y vs. Zr/TiO_2 as immobile trace elements and once again they show sub-alkaline series too. On the AFM diagram majority of samples fall into calc-alkaline domain next to tholeiitic border. REE pattern in chondrite normalized spider diagram reveal LREE enrichment by a factor of 30 to 80 and HREE depletion by a factor of 10. There is no Eu and Sr anomaly thus plagioclase differentiation hasn't main role to control of evolved magma. All of the samples represent intra plate rift gabbros on TiO_2-Y/20-K2O diagram.
Consequently, a peridotite with ratio of [garnet/ (garnet+spinel)] $\approx$ 0.3 to 0.5, at 70 to 100 km depth from enriched source, has undergone 10% to 15% partial melting to produce primary magma. This ascending primary magma has experienced fractional crystallization and crustal contamination. Finally about 400 Ma ago it was emplaced into Paleozoic Iranian platform by extension movement.