Geochemistry and petrology of gabbrodiorites from Palang Dar Area (Northeast Damghan)

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Abstract: Palang Dar gabbrodioritic intrusion cropped out in about 30 Km NE of Damghan in the eastern part of the Alborz structural unit. In this area a few small-scale gabbrodioritic intrusions and diabasic dikes with Middle Jurassic age intruded into shale, sandstones and limestones of Shemshak Formation. Emplacement of this intrusion into host rocks are associated with contact metamorphism and formation of marble. Field observation and petrography indicate evidences of fractional crystallization from olivine-gabbro to gabbro, pegmatoid gabbro and diorite. Olivine, clinopyroxene (augite), plagioclase, hornblende and biotite (essential minerals), rutile, sphene, apatite, magnetite and zircon (accessory minerals), chlorite, calcite, epidote, secondary sphene and iron oxides (secondary minerals) found in these gabbrodiorites and fractionated members. These rocks have alkaline to calc-alkaline nature and based on discrimination tectonic setting diagrams, they plotted in the domain of basalt in relation to intracontinental extensional setting (back arc basins). Evaluations of REE diagrams and spider diagrams which normalized to chondrite and primary mantle (in respectively) indicate that the studied rocks enriched in light rare earth elements (LREEs) and large ion lithophile elements (LILEs), and depleted in heavy rare earth elements (HREEs) and high field strength elements (HFSEs). Based on geochemical and petrogenetical studies, alkaline-calc-alkaline magma formed the Palang Dar gabbrodiorites from low rate partial melting (about 10 percent) of a metasomatized subcontinental lithospheric mantle with original garnet peridotitic nature in nearly 100 to 110 Km depth and in intracontinental extensional setting (back arc basin). Geochemical evidences indicated magma forming of Palang Dar gabbrodiorite contaminated with upper crustal during it’s ascend and emplacement. These magmatic activities had been a part of magmatic activities in relation to synchronous with extension and extent of Jurassic back arc basin of Alborz.

Keywords: Gabbrodiorite; garnet peridotite; back arc basin; Middle Jurassic; Palang Dar; Damghan.

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