

Petrology and geochemistry of Qaradagh batholith, NW Iran

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Qaradagh batholith (QDB), with about 500 km² outcrop area, forming the largest granitoid intrusive complex in NW Iran. The QDB is part of Qaradagh–Meghri–Ordubad granitoid complex extends through NW Iran, southern Armenia, and the eastern part of the Autonomous Republic of Nakhchivan. It is part of the Alborz–Azarbaijan geo- structural zone in the Central Iranian domain and is also considered part of the Lesser Caucasus mountain ranges. The country rocks of the QDB consist mainly of pre-Upper Cretaceous metabasite rocks on its north side, and Upper Cretaceous volcanic and sedimentary rocks to the south, east and west. The QDB composed of several magmatic phases including gabbro, diorite, quartz-diorite, quartz- monzodiorite, quartz- monzonite, tonalite, granodiorite, monzogranite and porphyritic granite; granodiorite is the dominant phase. Vast alteration zones have developed within and around QDB, and the magmatic–hydrothermal fluids derived from the discrete intrusive phases formed Kadjaran and Agarak porphyry Cu-Mo deposits in Armenia, and Qarachilar, Qaradareh, Zaylidareh, Anigh, and Pirbolagh vein-type Cu-Mo-Au and Kamtal, Pahnavar, Avan and Astamal Fe-Cu skarn deposits in Iran. Geochemical data indicate a medium to high-K calc-alkaline, metaluminous and I-type signature for granitoids; classified them as amphibole rich calc-alkaline granitoids (ACG). However, monzo-granite and porphyritic granite show K-feldspar rich calc-alkaline granitoids (KCG) characteristics. The QDB acidic phases have similar chondrite-normalized REE patterns with high LREE/HREE ratios and negative Eu anomaly, may suggest that they are co-genetic magmas. Gabbros show two different REE patterns; a flat one with low LREE/HREE ratios, and a steep ones with high LREE/HREE ratios. The former was probably produced by high melting ratio of a depleted mantle source. On the primitive mantle-normalized spider diagram, all QDB magmatic phases have negative Nb, Ta and Ti anomalies, indicate a subduction-like signature. Tectonic setting discrimination diagrams of granitoid rocks indicates VAG setting for the QDB, which is probably produced as a consequence of Khoy-Zanjan back-arc basin subduction beneath Alborz-Azerbaijan continental crust.