



Petrology of upper Eocene-Oligocene plutonic rocks of Moalleman Damghan area

Reza Kohansal (1), Seddigeh Zolfaghari (1), and Mohammad Hashem Emami (2)

(1) Geological survey of Iran, Tehran, (kohansal_reza@yahoo.com), (2) Research Institute for Earth Science, Geological survey of Iran.

Abstract

The plutonic rocks of this area include cryptodomes, hypoabyssal plutonic bodies and dikes which intruded in to the late Lutetian- late Eocene rocks.

The hypoabyssal plutonic rocks in Moalleman are classified in to two main groups:

- Acidic rocks, including microgranite to microgranodiorite.
- Intermediate rocks, including microquartzmonzodiorite to microquartzdiorite of hypoabyssal type.

Presence of fine-grained mafic xenoliths with abundant biotite, amphibole and pyroxene in the intermediate rocks may be considered as an evidence of the role of mantle melting occurrence in the formation of these rocks. Occurrence of a felsitic texture, showing a high differentiation coefficient and existence of large quarts which are embayed, rounded and infiltrated by material, and finally turmalinization in the acidic rocks due to Boron metasomatism suggest the role of crust in the formation of afore mentioned rocks as well.

In some acidic rocks plagioclases show oscillatory zoning. This phenomenon along with the fact that biotite granites in these rocks crystallized before crystallization of quarts and after crystallization of alkali feldspar suggest that the crystallization of these rocks accomplished in the presence of 2 percent water, perthitic texture in some feldspars of the intermediate rocks this conclusion.

Supports on the basis of the geochemical studies most of the hypoabyssal rocks of Moalleman area fall in subalkaline- calcoalkaline fields.

Variation of immobile incompatible trace elements versus differentiation coefficient and the situation of samples in winkler diagram show the role of crustal- melting in the formation of acidic rocks.

Trace element content of some rocks (e.g. Cu and Sm) with in this group show mantle specification, while some other rocks (e.g. Zr, Th, Hf) show crustal specification. The intermediate rocks of the study area therefore, indicate a hybridization of magmas from both the mantle and crust.

Study of the temperature and water vapour pressure of the hypoabyssal plutons of study area indicate that the formation of these rocks probabably began with the crystallization of plagioclases and amphibole phenocrysts at about 850 to 900 degree centigrade, and the pressure 1 to 3 kbr. The process continued with the crystallization of biotite and quartz at about 700 to 750 degree centigrade and 0.5 to 1 kbr, and terminated by the crystallization of matrix at about 680 degree centigrade and 1 to 1.5 kbr pressure.

According to petrological, mineralogical and geochemical specifications genesis of acidic rocks of Moalleman area is interpreted as cordilleran I type granites. Considering the hybridization phenomenon it seems that magmatic genesis of the intermediate rocks is comparable wih hybrid granitoids type.