



# Petrogenesis of Soheyle- Pakuh and Golshekanan granitoid based on mineral chemistry of ferromagnesian minerals (north of Nain), Iran



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## ABSTRACT

The Middle Oligocene I-Type Soheyle- Pakuh and Golshekanan granitoid (SPGG) occurs in Urumieh-Dokhtar magmatic belt and north of Nain in central part of Iran. The dominant studied intrusive rocks are diorite, quartz-diorite, tonalite, granodiorite and granite which petrographically are characterized by the presence of plagioclase, quartz, K-feldspar, amphibole, pyroxene, biotite, apatite, titanite, zircon, tourmaline, allanite and opaques. The pyroxenes comprise calc-alkaline augite, calcic amphiboles and Fe-rich biotite. Using  $Fe^{2+}/Fe^{2+}+Mg$  and  $Al^{(tot)}$  for primary amphiboles, an average pressure of 2 Kbar was estimated corresponding to the depth of between 3.63 and 10.88 km. Further, the low  $Na_2O$  and  $TiO_2$  contents of these phases suggest subduction environment (S-Amph). Distribution of aluminum in clinopyroxenes suggests that these minerals formed at <5 kbar pressure and their water content was between 5 to over 10 percent. Biotites from gabbroic diorite, diorite and tonalite, using Ti and  $Mg/Mg + Fe$  diagram, crystallized at temperature of about 720 °C whereas, the pyroxenes and enclaves solidified in the range of 1100–1175 °C. The overall geochemical data suggests that the SPGG are high temperature, I-type, calc-alkaline developed in high oxygen fugacity in an orogenic tectonic setting related to volcanic arc environment consistent with the subduction of Neotethys oceanic underneath the Central Iranian microcontinent during Upper Cretaceous to Paleogene.

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## 1. Introduction

The Zagros Orogenic Belt is situated within the Alpi–Himalaya orogenic system and extends in a northwest–southeast direction for about 2000 km from the Taurus Mountain of southeastern Turkey to the Bandar–Abas syntax in southern Iran. The Zagros orogenic belt of Iran consists of three parallel tectonic subdivisions from northwest to southeast: (1) the Urumieh-Dokhtar magmatic belt, (2) the Sanandaj–Sirjan zone and (3) the Zagros folded-thrust belt (Alavi, 2004).

The Urumieh-Dokhtar magmatic belt is 150 km wide, forms a subduction related, distinctively linear and voluminous magmatic arc composing of tholeiitic, calc-alkaline, and K-rich alkaline intrusive and extrusive rocks (with associated pyroclastic and volcanoclastic successions) occurring along the active margin of the Iranian plate (Alavi, 2004).

Although magmatic activity continued from the Cretaceous to recent times, the peak activity in the Urumieh-Dokhtar magmatic

belt occurred in Eocene times (Dimitrijevic, 1973). The magmatic activity is predominantly calc-alkaline (Ahmad and Posht-Kuhi, 1993; Shahabpour, 2007) but alkaline rocks of the Miocene age were also reported (Moradian, 1997). The steep dip of the subducting oceanic slab and the presence of a ‘slab window’ may have been responsible for the formation of scattered alkaline rocks in the volcanic belt (Shahabpour, 2005). The Zagros orogenic belt is thought to have resulted from the opening and subduction of the Neotethyan oceanic realm and subsequent oblique collision of Afro-Arabia (Gondwana) with the Iranian microcontinent in the Late Cretaceous–Early Tertiary (Berberian and Berberian, 1981; Alavi, 1994; Mohajjel and Fergusson, 2000).

The Soheyle- Pakuh and Golshekanan granitoid (SPGG), a part of Urumieh-Dokhtar volcanic belt, is situated in the north of Nain (Fig. 1). According to Davoudzade (1972), the northern part of Nain is divided into three sections:

- (1) Colored Mélange Complex (peridotite and serpentite with minor dunite and pyroxenite) (Upper Cretaceous) trending NW-SE and extending to Soheyle- Pakuh village.

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