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PETROLOGY AND PETROGENESIS OF INTRUSIVE IN NORTH-EAST SAVEH, IRAN

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Abstract- In this paper the studied area is located in the part of 1:250000 the geological map in the NE of Saveh city in Iran. It is located at East longitudinal between 50° 25' to 50° 36' and North latitude 35° 7' to 35° 10'. This region is located in Urmia-Dokhtar zone and related Cenozoic age. In this area some of intrusive masses with the composition acidic to basic and petrology of quartzulit, granite, granodiorite, quartz syenite, quartz monzonite, syenit, synodiorite, monzonite, monzodiorite and diorite. The Most majority minerals are including quartz, plagioclases and orthoclase. Between faults, Kushke Nousrat fault trend N100 of North-West region to enter the area and its removed continuation in the South-East of this area, alteration rate in most rocks of medium and high. Petrography and geochemical evidences indicate the calcalkaline nature with medium to high potassium and metaluminus to peraluminus of the major magma.

Keywords: Petrography, Alteration, Plutonic Rocks, Geochemical.

I. INTRODUCTION

The region of study is in the Eastern lengths of 50° 25' to 50° 36' and Northern widths 35° 7' to 35° 10' in the 15 km to North-East of Saveh in the Markazi province of Iran. In this region there is a wide range of igneous rocks made of a various of intrusive and outputs to the tertiary age and some sedimentary units with Eocene - Oligocene ages and younger than that. In this research the igneous plutonic rocks were studied. The main objectives of this research consist of identification and nomination of all types of plutonic and sub volcanic rocks of north east of Saveh region and reviewing the structural and stratigraphy relationship of these rocks with other units of the region.

This region has a dessert climate. The average precipitation in the last 30 years in this region was equal to 50.8 mm and regarding the average weather temperature, the maximum temperature is about 24.13 Celsius degrees and the minimum of that is around 18.42 Celsius degrees during a year.

The access to the region is through Tehran-Saveh highway, this region is between the old road of Saveh and the railway. The main villages of this area are Jafarabad, Aliabad as shown in Figure 1.

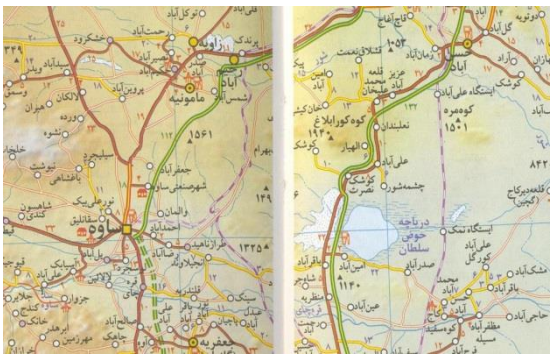

Figure 1. The connecting way of the mentioned region

The topography of the region is rugged and there is no river, just some stream floods in this region, the maximum height of the region is 166 meters and the minimum of that is 1209 meters from the sea level.

This research is done through several steps, in the first step different information including previous reports of the region, topographic maps with the measure of 1:50000 from Saveh and Farajabad; geological map of Saveh (1:250000) (Figure 2) were collected. Through the second step after library studies and reviewing the literature, the planning for desert operations and sampling, was started. Through the desert operations, 80 rocks were sampled and from 50 of them a thin cross section was caught.

After petrography studies, 10 samples were selected for XTF chemical analysis and sent to a geochemistry laboratory for chemical analysis. It is taken from the Saveh map in the measure of 1:250000, Kaya and et al, 1978.

In the next section of the paper, geology, stratigraphy, lithology and geochemistry of the plutonic rocks in the region are described.

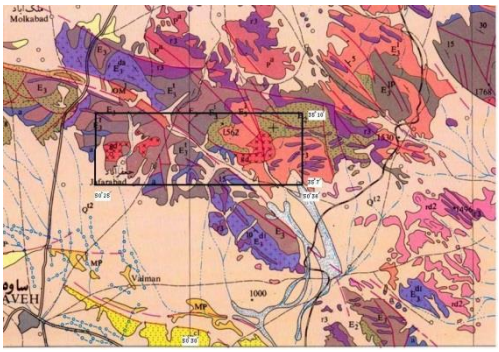

Figure 2. Geological map of the region

II. GENERAL GEOLOGY OF THE REGION

The region is in the 15 km of north east of Saveh, Iran and this is a part of central Iran zone and mainly is made of igneous rocks of (diffusion and output) Tertiary Urmia-Dokhtar zone. According to the geology 1:250000 square map of Saveh (Kaya and et al, 1978), the original stone sculptures of this region consist of sedimentary and igneous bodies. Plutonic structures of the North-East Saveh are belonging to the Eocene and even after that and consist of granitoid units and different layers. Desert studies, lithology and geochemistry shows that this region has got a various and coherent spectrum of lithology combinations consisting of granite, granodiorite, quartz syenite, quartz monzonite, synite, sino diorite, monzonite, monzo diorite and diorite.

A. Stratigraphic of the Study Region

In the lower Oligocene, tectonic movements that have affected the whole country of Iran, also caused compressions in Saveh region that has finished the Eocene rift activity and closed it and eventually elevated the output rocks whose establishment and replacements have been associated with the large region fractures (Aoj and Kooshk Nosrat faults).

From the petro graphical point of view, generally the region rocks are granite, grano diorite, synite and diorite that sometimes because of heterology, calcite is located in them. Alkali feldspar and plagioclases are also affected by heterology.

Alkali feldspar and plagioclases shaped specially in an average mode because of heterology. grano diorites of the region generally have grain texture. Rock units of the region from the old to the new versions consist of volcanic rocks and Eocene sedimentary mid layers and after Eocene garno diorite plutonic rocks that the main subject of this research is about after eocenegrano diorite rocks.

III. LITHOLOGY

A. Quartzolite

In microscopic cross sections, they have coarse and radiant granular texture. Mostly the crystals have got a diagonal with a measure about few tenths of mm to 3 mm. Main minerals consist of quartz and orthos, Hematite was also seen randomly (Figure 3).

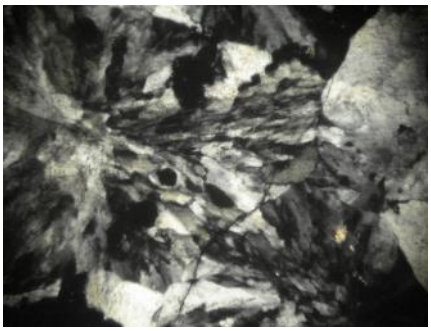

Figure 3. Microscopic section of quartzolite (XPL, 50x)

B. Granite

In microscopic cross sections it has a grainy porphyry texture that mainly the crystals have a diagonal of a tenth of one mm to 3 mm. The main minerals are quartz, orthos and Plagioclase and also among the crystals there were seen opec, sericitic and hematite minerals (Figure 4).

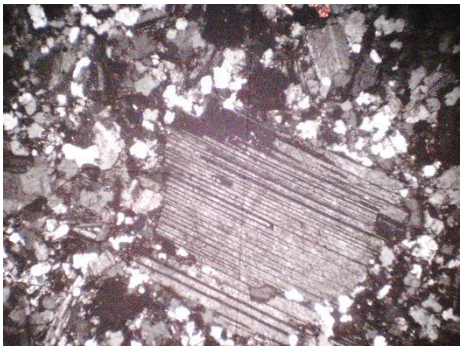

Figure 4. Microscopic section of porphyry grano diorite (XPL, 50x**)**

C. Grano Diorite

It has a grainy texture mainly in microscopic cross sections. The minerals consist of quartz from its half shaped to amorphous, plagioclase also to its half shaped to amorphous with twining poly-synthetic, orthos Alkaline feldspar, green hornblende and sometimes brown and to its half shaped, opec, sphene and chlorite (Figure 5).

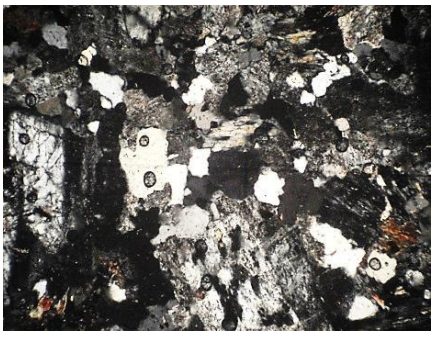

Figure 5. Grano diorite microscopic cross (XPL, 50x)

D. Quartz Syenite

Often it has a fine texture. It has got main minerals such as orthos, plagioclase and quartz that opec, sphene and sericite minerals are seen within them. The crystals diagonal is from a tenth of one mm to 1 mm (Figure 6).

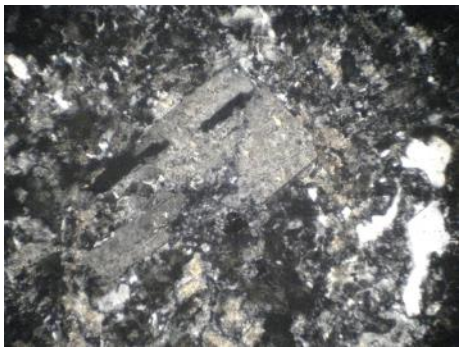

Figure 6. Quartz syenite microscopic cross section (XPL, 50x)

E. Quartz Monzonite

It has got a grainy texture and consists of minerals like plagioclase with its half shaped to amorphous and quartz with shaped to its half shaped crystals and it also has got minerals like opec, hematite and sericite and calcite. The crystals diameter is from tenth of one mm to 1.5 mm (Figure 7).

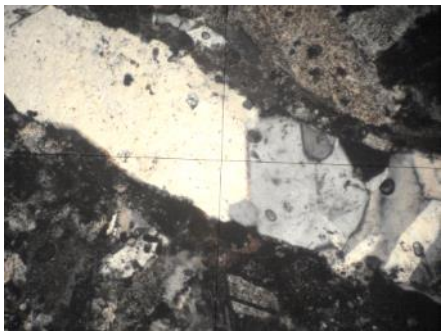

Figure 7. Quartz monzonite microscopic cross section (XPL, 50x)

F. Syenite

It consists of main minerals like orthos, plagioclase and quartz and opec, chlorite and pyroxene minerals with diopside type. The diameter of the crystals is from tenths of one mm to 1 mm (Figure 8).

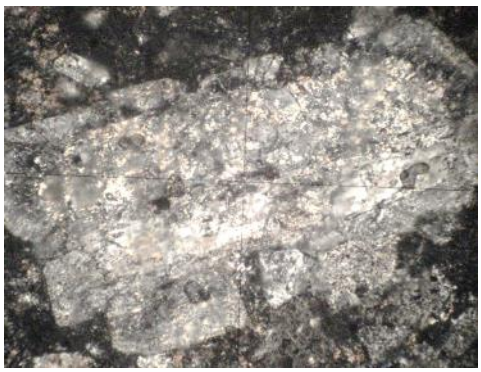

Figure 8: Syenite microscopic cross section (XPL, 50x)

G. Syeno Diorite

It has got a porphyry texture and consists of main minerals such as plagioclase, orthos, and quartz. The diameter of the crystals is from tenths of one mm to 1 mm (Figure 9).

Figure 9. Sino diorite microscopic cross section (XPL, 50x)

H. Monzodiorite

It has got a porphyry texture and its main minerals are plagioclase, orthos and quartz. Hornblende and Pyroxene minerals are also seen among them. The diameter of the crystals is from tenths of one mm to 2 mm (Figure 10).

Figure 10. Monzodiorite microscopic cross section (XPL, 50x)

I. Diorite

It has got a grainy texture (Figure 11) and consists of main minerals such as plagioclase, quartz and orthos. The plagioclases have got a zoning mode and the diameter of the crystals is up to 1 mm. Pyroxene, opec, hornblende, sphene, aericite and calcite are also seen among them (Figure 12).

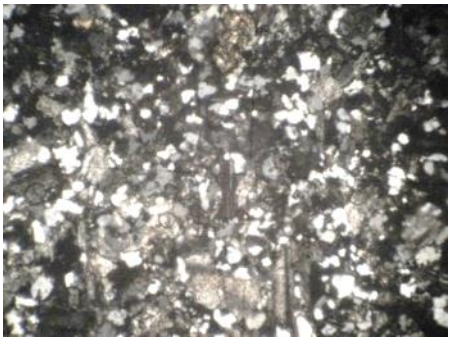

Figure 11. Grainy texture is a diorite (XPL, 50x)

IV. GEOCHEMISTRY

In the Normativ Wilson and et al. (1989), the samples are in the range of granite, quartz diorite (grano diorie), quartz monzonite, syenite, sino diorite, monzonite, monzodiorite and diorite (Figure 13), in De La roche, and et al. (1980) classification, in range of granite, grano diorite, tonalite, quartz monzonite, Syenite, sio diorite, monzonite and monzodiorite (Figure 14).

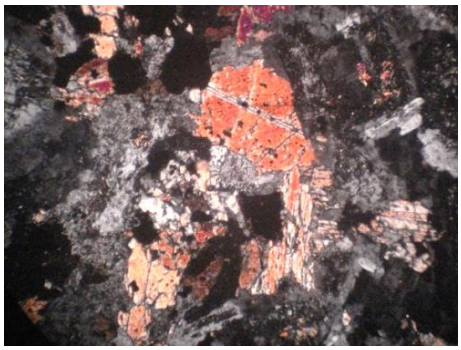

Figure 12. Diorite microscopic cross section (XPL, 50x)

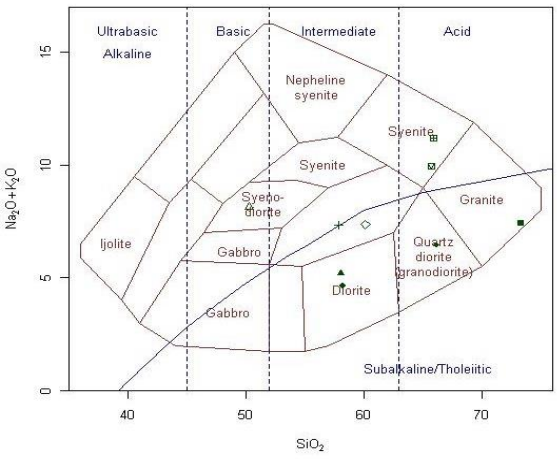

Figure 13. The condition of Igneous in the region through the classification of SiO_2-(K_2O+Na_2O) Wilsson and et al. (1989)

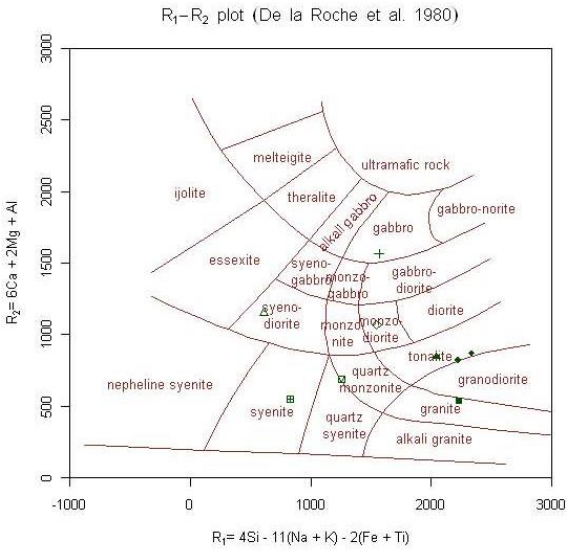

Figure 14. R2 vs R1 diagram (De La roche, and et al. 1980)

The studied samples in the determination of the magmatic series diagram of Rickwood (1989), are calc-alkaline and high potassium calc-alkaline and in the Miashiru diagram (1974) and AFM of Irvin and Baragar (1971) in the calc-alkaline range. Also studied samples with regard to the Maniar and Picoli diagram (1989) are in the Meta aluminum to Per aluminous (Figures 15-18).

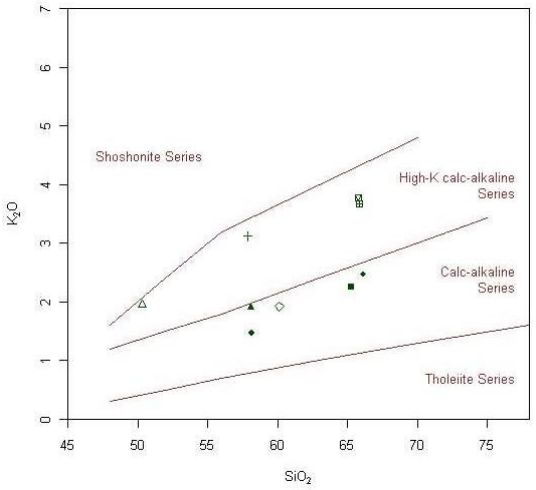

Figure 15. Determination of magmatic series of the region granitoid plutonic according to the diagram of K_2O-SiO_2 Rickwood (1989)

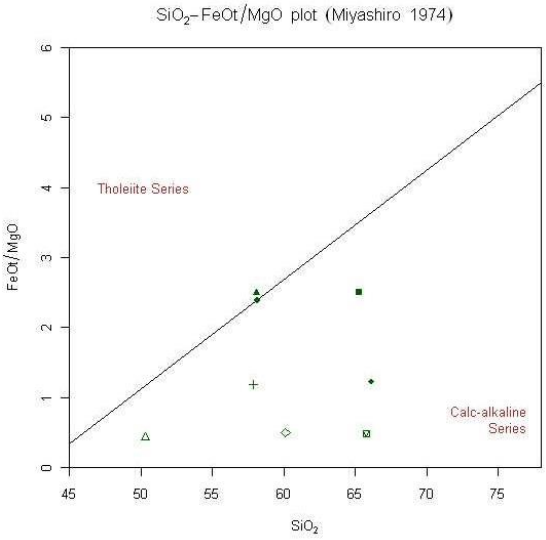

Figure 16. Determination of magmatic series of granitoid plutonic of the region based on the (MgO/FeO)-SiO_2 Miashiru (1974) diagram

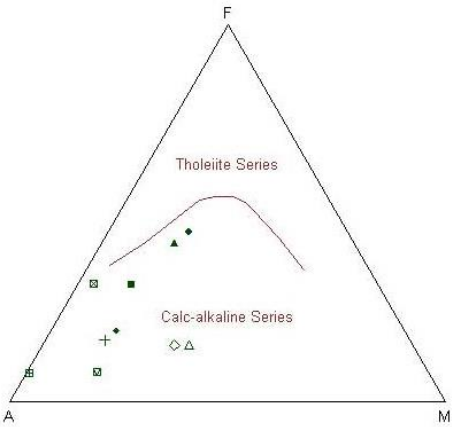

Figure 17. AFM diagram of Irvin and Baragar (1971)

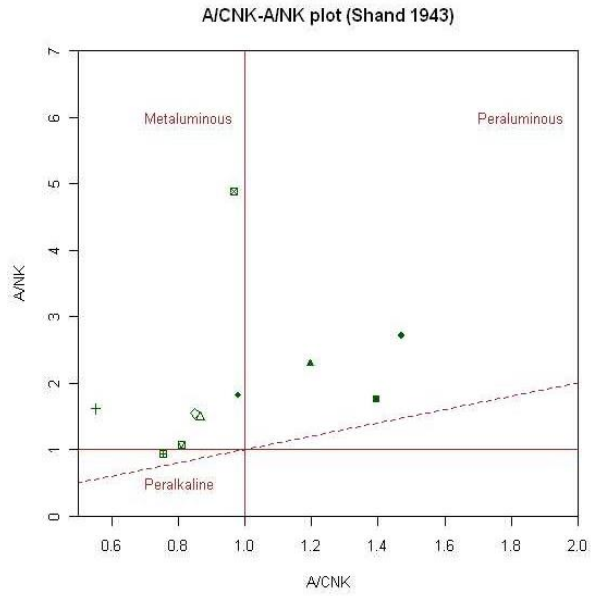

Figure 18. Determination of the enrichment of alumina in the plutonics of the region based on the (Na_2O+K_2O)-SiO_2 Maniar and Picoli (1989)

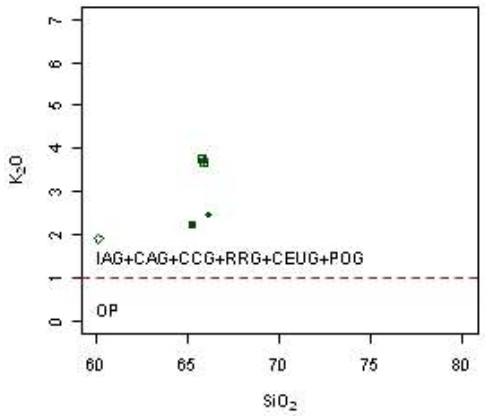

Figure 19. Position of the samples in Determination of tectonic environment diagram of K2O-SiO2 Maniar and Picoli (1989) diagram

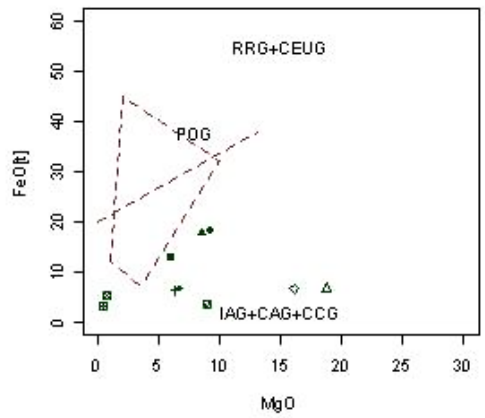

Figure 20. Position of the samples in the Determination of tectonic environment diagram of FeO-MgO Maniar and Picoli (1989) diagram

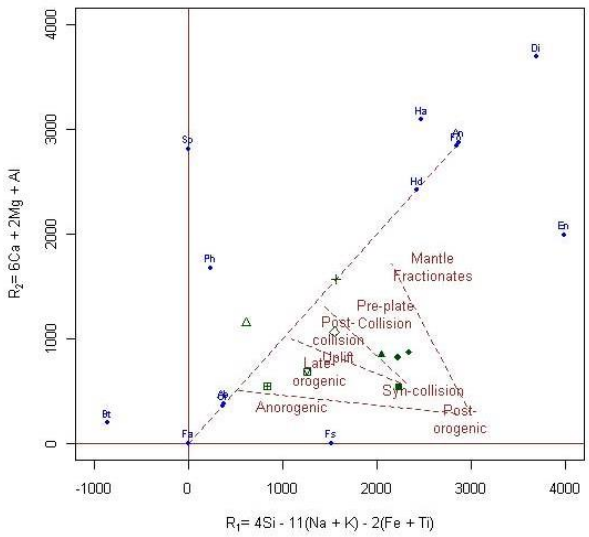

Figure 21. Bachelor and Budden (1985) diagram

According to the magmatic diagram the sample rocks in the K_2O diagram in comparison with SiO_2 of Maniar and Picoli (1989) are in the Granitoides range, i.e. (IAG+CAG+CCG+RRG+CEUG+POG) (Figure 19) and according to the FeO diagram in comparison with MgO Maniar and Picoli (1989) are in the arc islands granitoides, continental arc granitoides and continental collision granitoides (Figure 20) , and also in the determination of Tectonic environment diagram of Bachlor and Budden (1985), are in the range of uplift after collision, the range after orogenic and the range of simultaneous continental collision (Figure 21).

V. CONCLUSIONS

The studied region is in the 1:250000 sheet of Saveh with peculiarities of 50degree25 to 50degree36 east length and 35degree7 to 35degree10 north width of Saveh sheet. This region is located in the Urmia-Dokhtar zone. All the rock displaying belong to the Cenozoic era.

Analyzed samples from the enrichment of alumina point of view, have the characteristics of Meta aluminum to Per aluminum and it is probably because of the kaolin phenomenon and release of ingredients from the feldspars structure with increase of Al in the rocks.

According to the chemical classification of Wilsson and et al. (1989), plutonic rocks of the region consist of granite, quartz diorite (grano diorite), quartz monzonite, syenite, sino diorite, monzonite and diorite. For determination of the magmatic series of the SiO_2/K_2O Ricood (1989), sample plutonic rocks are in the calc-alkaline and high potassium calc-alkaline range, In the SiO_2-(FeO/MgO) Miashiru (1975) diagram, most of the samples have a calc-alkaline nature. The analyzed samples have characteristics of Meta aluminum to per aluminum from the enrichment of aluminum point of view. According to the triangular diagram of AFM Irvin and Baragar (1971), rocks are in the calc-alkaline range.

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