



**Petrography, mineralogy and geochemistry of Solh Abad igneous masses
(S.W. Bajestan – Razavi Khorasan)**

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Abstract

The investigated area in south west of Razavi Khorasan province located in 1: 250000 topography & geological map of Ferdos which is considered as part of structural zone of central Iran and as part of the northern margin of Lut block. According to our field geological investigations and satellite image studies indicate that the main volcanic rocks whit acidic to intermediate composition (rhyolite, dacite, Rio dacite, andesite, quartz andesite, quartz latite andesite) and Intrusive masses are (monzogranite, synogranite, quartz monzo syenite, quartz syenite) of area can be seen. Magma mainly consist meta-alumina and alumina. The change strike of faults is east - west of south side to north side.K- Feldspar masses are probably the main economic potential of the investigated area.

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Introduction

The investigation area is nearly 12 k/m². This area is located in the 1: 250000 geological map of Ferdows city. This region in the lengths of geography 58° 00' to 58° 30' and widths of geography 34° 00' to 34° 30' has taken place and the northern edge of Lut block. For reach to this area 1: Bajetan – Matrabad – Solh abad road (18 km - Northern Part) 2: Bajestan – Jazin – Senjedak road (45km – Southern Part).(Fig. 1)

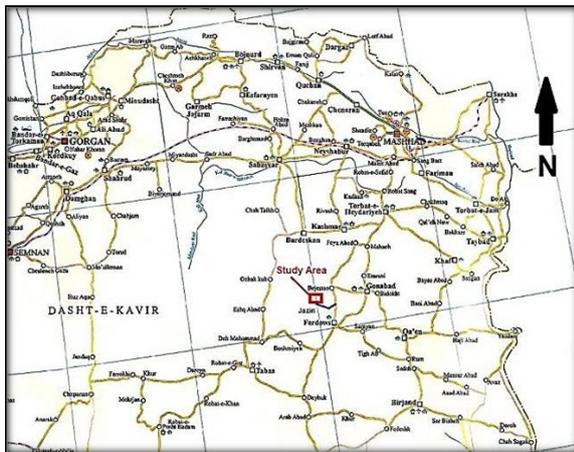


Fig. 1. The roads to reach of Solh Abad area.

At the regional scale, combined with acidic to intermediate volcanic rocks (rhyolite, dacite, Rio dacite, andesite, quartz andesite, andesite, quartz latite), intrusive masses (monzo granite, syeno granite, quartz monzo syenite, quartz syenite) rapidly in the region there. (Fig. 2).

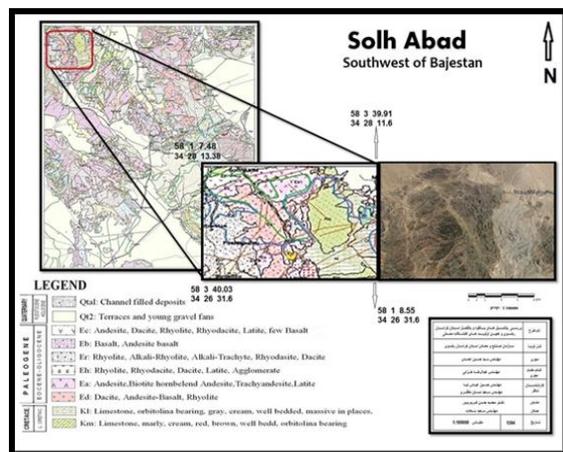


Fig. 2. The location of Area on the Geological map of Ferdows & satellite image.

Geology of the study area

According to studies, the most studied area of igneous rock units probable Tertiary age are internal and external. From old to new units include:

The igneous masses of solh abad - Bajestan (Eocen - Oligocene)

Unit E^a

The significant expansion in the range of Solh Abad (in the South and the North West to West of area) is the field outcrops of lava gray to black in color and relatively mild topography. In handi sample colored light gray to dark gray, fine-grained and proplitic texture is sometimes show that includes:

-Quartz andesite to Pyroxene quartz andesite: the main outcrops located in north-west to the north of Chlank, North and South of Poshteh zoo Village. These rocks show porphyritic and Amigdaloidal texture in petrografic study. the main minerals include plagioclase, alkali feldspar, quartz, common minerals include hornblende and pyroxene, accessory minerals include apatite and opaque and secondary minerals, chlorite, carbonate, sericite and clay minerals (Fig. 3 and 4).

-Quartz Latites andesite, biotite quartz latite andesite: The main outcrops located in the North West and South of area. the textures include Porphyritic and Hipidio morph granular and Glomeroporphyritic. The main minerals include plagioclase, alkali feldspar, quartz, common mineral, hornblende, pyroxene and biotite. Accessory minerals are zircon, apatite, opaque and secondary minerals, chlorite, carbonate, sericite and clay minerals. this section show carbonate, weak proplitic and argillic alteration. (Fig.s 3 and 4)

-Quartz Trachyte: The main outcrops located in North West or area. These rocks show trachytic and porphyritic texture in petrografic study. the main minerals include plagioclase, alkali feldspa, quartz, accessory minerals include zircon, apatite, and opaque and secondary minerals, chlorite, carbonate,

sericite and clay minerals. this section show carbonate, weak proplitic and argillic alteration. (Fig.s 3 and 4).

unit E^d

In field outcrops include high volume of greenish dark gray color to red and seen with mild topography and erosion falling. These rocks are dark gray to red color of the handi sample and sometimes show porphyritic texture (Fig. 3 and 4).

-Dacite to Rio Dacite: This part is exposed in the center and north of the study area. These rocks show porphyritic and amigdaloidal texture under a microscope. the primary minerals include plagioclase, alkali feldspar and quartz, apatite, opaque are accessory minerals and sericite, chlorite, carbonate and clay minerals are secondary minerals (Fig.s 3 and 4).

-Rhyolite: In the North West of the center of the study area is exposed. Under the microscope, these rocks Show porphyritic with Microlite texture. The primary minerals include plagioclase, alkali feldspar and quartz, common mineral, hornblende, apatite and opaque are accessory minerals, secondary minerals include carbonate, sericite, chlorite, secondary quartz and clay mineral and alteration zone contains argillic and silica. (Fig. 3 and 4)

2-2-intrusive

Internal units in the study area

MG unit

This part consists of subvolcanic intrusions in the southern part of the central area is exposed. The outcrops of this unit colored dark and cases silicification in many subjects, topography is tough. These rocks are dark greenish gray color of the handi sample and show porphyritic texture.

-Monzo Granite: the under a microscope these rocks show hipidio morph granular and aplitic texture and major minerals include quartz, plagioclase and alkali feldspar. commonly minerals include biotite, hornblende and accessory minerals are zircon, apatite

and opaque, secondary minerals carbonate, epidote and clay minerals is formed (Fig. 3 and 4).

-Syeno Granite: the hipidio morph granular and aplitic texture show under a microscope. main minerals include quartz, plagioclase and alkali feldspar. biotite, hornblende are common minerals and zircon, apatite and opaque are accessory minerals, secondary minerals include carbonate, epidote clay mineral (Fig. 3 and 4).

MZ unit

- quartz monzonite: This is one of the most intrusive rock units that range from extending substantially in the southern part of the center. Detection of minerals that can be plagioclase, quartz and opaque minerals. Under a microscope the rock textures, graphics and mirmekite, Rapakiviy and anti Rapakiviy and veins of very weak carbonate and sericite. major minerals are quartz, plagioclase, alkali feldspar. common minerals include hornblende, biotite. opaque, apatite and zircon are accessory mineral and secondary minerals are chlorite, calcite and secondary quartz. Intermediate argillic alteration and metal mineralization scattered low abundance in the rock background. (Fig.s 3 and 4).

- Quartz syenite: in the southern part of the South East area around the center of poshteh zoo as stocks and dikes outcrops into monzonite, monzogranitic and andesitic volcanic units have influence. from the distinguishable minerals can be quartz and alkali feldspar. Hipidio morph granular, mirmekit and graphically texture show in the rocks under the microscope. main minerals are such as quartz, plagioclase, alkali feldspar minerals. common minerals: hornblende, biotite, accessory minerals: apatite, zircon and opaque and secondary minerals such as clay minerals, chlorite and carbonate were formed. Altration of this part are moderate argillic and weak proplitic (Fig. 3 and 4)

Tectonics and Structural Geology

Structural Geology of the study area is heavily faulted and fractured. The rock units in different locations and situations falling sharply split show.

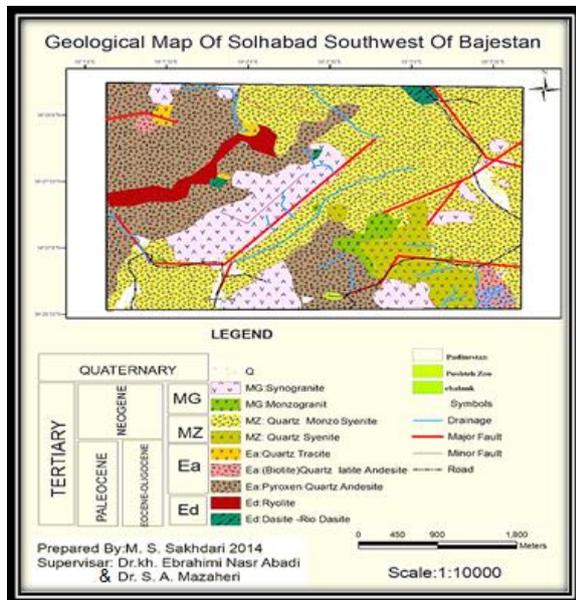


Fig. 3. Geological map of the study area at a scale of 1: 10,000.

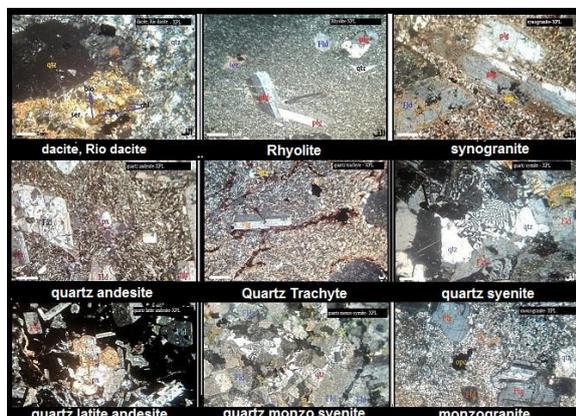


Fig. 4. Microscopic image of Rock Units.

The major faults of this area are mostly strike slip fault. Strikes include is NE-SW ·E-W and N-S. Mazar and Nay Band Fault are important in this area. Mazar fault is the biggest fault in this location whit strike along the southeast – northwest (length of this fault is 30 km) .this fault continues to near of Zin Abad and Bakri village in central of Fedows map. Nay Band fault include N-W strike and length 600 km located in west of Lut desert and visibale of Boshruyeh area to

Bam. Boshruyeh and Bajestan dents also may be associated with this fault.

Geochemistry

In this classification, total alkaline elements ($Na_2O + K_2O$) versus SiO_2 and has been used by different authors in different faces is such that it can be classified (Middlemost 1985,1994) noted that the boundary andesite, dacite placed. According by (fig 5.a) intrusive masses sample of study area located on Granite to Quartz Monzonite and extrusive masses located on Rhyolite ,Andesite and Dacite (fig 5.b).

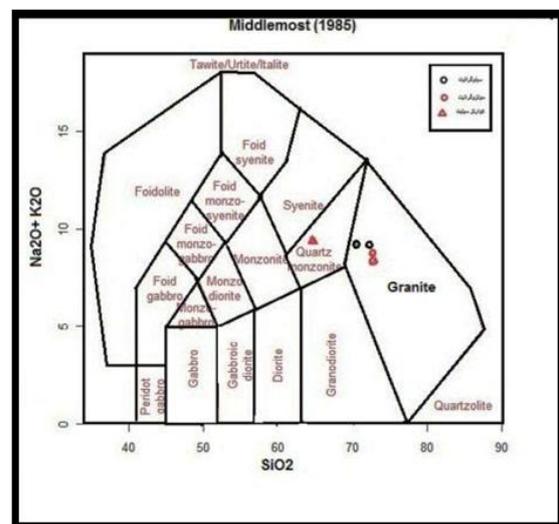


Fig. 5. a) TAS diagram of $Na_2O + K_2O / SiO_2$ (Middlemost, 1985).

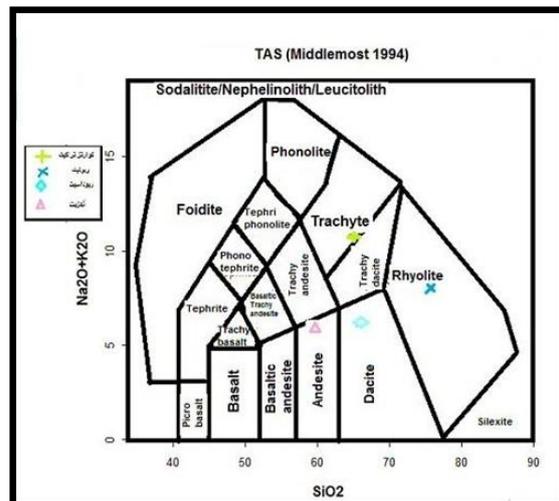


Fig. 5-b) TAS diagram of $Na_2O + K_2O / SiO_2$, (Middlemost, 1994).

Rock studied in diagram (Peccenillo and Taylor, 1976) on SiO₂ versus K₂O located on part of high potassium calc-alkaline and the tholeiitic series (Fig. 6)

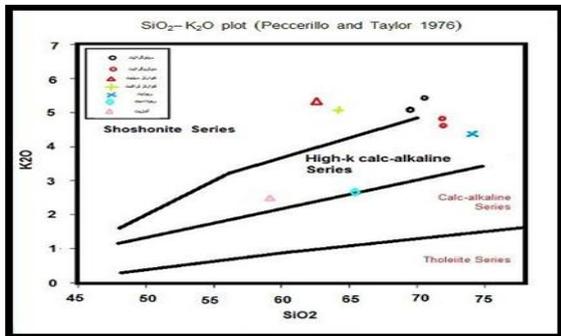


Fig. 6. type magmatic series chart (Peccenillo and Taylor, 1976).

Change trend of TiO₂, Al₂O₃, MgO, CaO, Na₂O, P₂O₅, FeO^t versus SiO₂ show decreasing trend. this process for reasons such as aluminum oxide and calcium oxide to participate in building plagioclase because in the early stages to be seen. change trend of K₂O towards SiO₂ show an increasing trend due to the high ionic radius able to participate in the constituent minerals will be in the early stages of differentiation (Fig. 7).

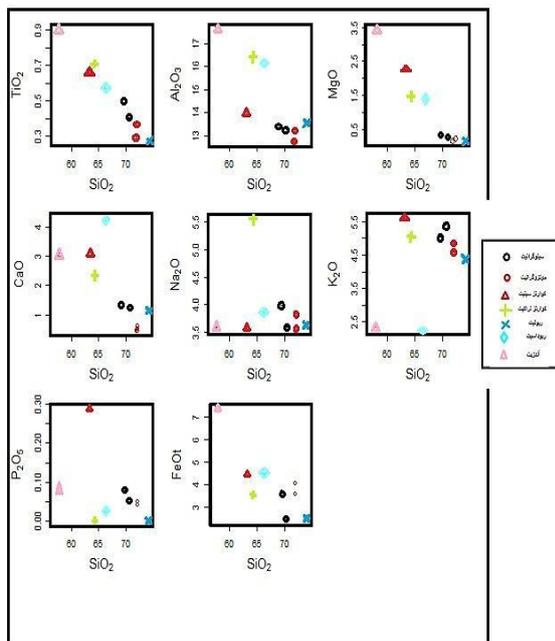


Fig. 7. chart to determine the trend of magmatic rocks in the study area with the main elements of the SiO₂ (Harker., 1909).

Minor trace element behavior during magma evolution can be explained in terms of their distribution between liquid crystalline phases was studied. When the molten mantle of trace elements tend to be present in the liquid and solid (mineral) phase show up.

Igneous rocks in the area of the diagram elements is used. The values are as follows:

1. Primitive Mantel diagram for Comparing of rock chemistry with primitive mantle and normalized levels.

2. Chondrite REE diagram for comparing or rock chemistry whit chondritic rare elements and normalized levels.

negative Eu element anomalies dirt can be seen that this represents a high oxygen fugacity during the crystallization of plagioclase rocks or separate at the beginning of the differentiation of magma. Amphibole and pyroxene are negative Eu anomalies and plagioclase is positive Eu anomalies. The presence of this shop will be rejected together and makes adjustments Eu anomaly (Martin, 1999). amphibole and plagioclase crystallization simultaneously in acidic rocks will be no Eu anomaly. (Fig. 8). Anomalies negative Ti and Nb as well as indicators of continental crust that may indicate the involvement of crustal magmatic processes or characteristics of magmatism associated with the subduction (Kuster & Harms, 1993), or a sign of the poverty of the elements in the source and the stability of phases containing these elements during melting part or separation during the differentiation process (Wu *et al*, 2003) can be a sign of released fluid from a subducted oceanic crust is the mantle peridotite partial melting and the formation of andesitic magma is possible. Negative anomalies P represents the rate of melting down .anomaly positive Cs can be sign of magma separation by crustal materials, reseon to the high concentration of this element in Continental curst (Fig. 9) negative anomalies K element due to the formation of apatite, which is abundant and subtract this mineral is created (Fig. 8)

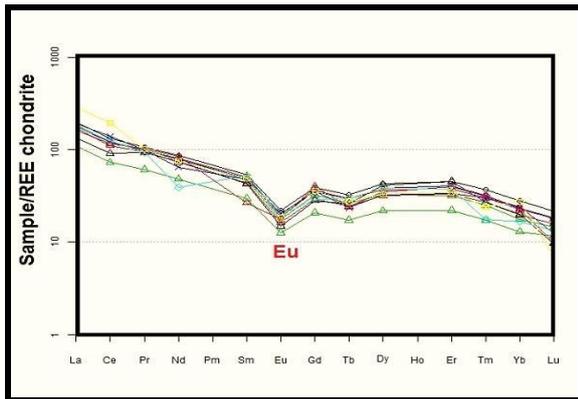


Fig. 8. Prevaence of rare earth elements in rocks of the area Comparing of chondrite-normalized Meteorite (Boynnton, 1984).

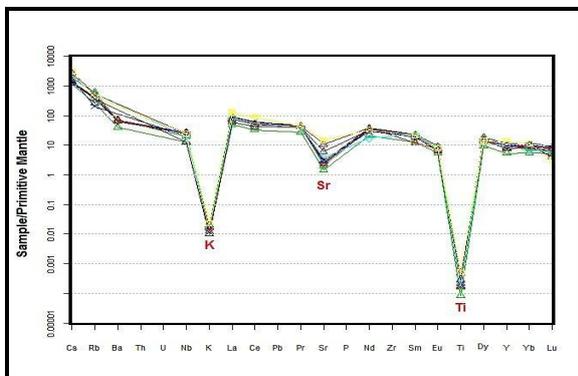


Fig. 9. normalized diagram to primitive mantle.

Tectonic position on major and minor elements

To determine the mass of rocks tectonically also studied the diagram (Bachlor & Bowden, 1985) and logarithmic graphs Pierce *et al* (1984) is based on the diagram Rb versus Y + Nb rocks in the study area made in WPG + VAG. also the charts Y – Nb located on the range of WPG to the VAG + SynCOLG (Fig. 10)

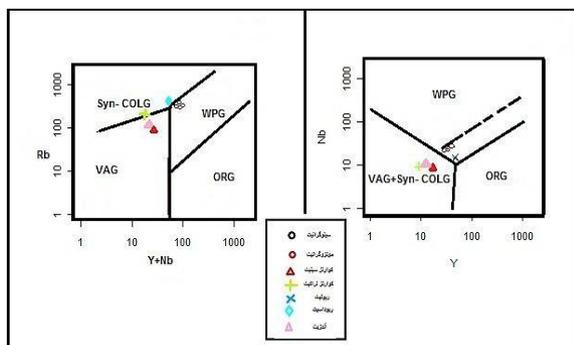


Fig. 10. tectonic position according by minor elements (Pearce *et al.*, 1984).

Conclusions and recommendations

Geological studies to cause the identification of units in the study area consists of intrusive rocks, volcanic rocks and alluvial deposits, respectively.the most of intrusive of this area include quartz monzonite, alkali granite and monzo granaite in north and north west parts of area.this mass is cause of main altration. some cases such as alkali granite masses themselves can be regarded as a mineral, such as feldspar samples. metal potential of the metal to build solh abad, had very low grades. on studies have high volumes of acid-alkali granitic intrusions and volcanic outcrops in the northwest area. These masses have high levels of Al₂O₃, Na₂O and K₂O oxides are the most important and can be a potential for the discovery of feldspar in the region.

Rocks studied located on High potassium calc-alkaline and the tholeiitic series and mass range of metaluminous to peraluminous granitoids studied in the Figure-of Spider diagram studied samples showed negative anomalies of Nb and Ti. this is properties of the arc magmatism. The Eu element negative anomalies are clearly seen, possibly due to extensive fractional crystallization of plagioclase in the magma during crystallization.

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