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Mineralogical characteristics of chah basheh felsic volcanic rocks in the S Naein (Central Iran)

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Key words: Chah basheh, Tuff rhyolite, Volcanic rocks, Porphyric texture, Precambrian.

Abstract

The age of Chah Basheh rhyolite and tuff rhyolite is Precambrian and are located in the Central Iran, 115 km from east Isfahan and S Naein. Rhyolites of Chah Basheh are containing large crystals of quartz, plagioclase with high rate of albite and alkali feldspar. The phenocryst of quartz can be seen in the field and also as microcrystal and are often subhedral to euhedral and is the most frequent phenocryst in these rocks. Large quantities of quartz have corrosion Gulf. Plagioclases often have euhedral phenocryst, sodice composition and albite to oligoclase combination. Two generations of plagioclase can be seen in these rocks. Most plagioclases changed to secondary minerals such as serysyty and some of them are filled by chlorite, penin and calcite. Alkali feldspar finds as fine crystal and often changed to kaolinite. These volcanic rocks have a felsophyric texture with SiO2 and k-feldspar.

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Introduction

Oldest rocks of this area belong to Soltanieh formation which includes dolomite - rhyolite - shale - limestone with some chert layers. This formation is distinct from other region formations by a fault along Naein - Baft fault (Dehshir - Baft fault) (Emami, 1996). Limestone and shale formation are related to the lower Cambrian period and are containing fossils Trilobites and Konodont (vahabi Moghadam, 1993). Outcrops of Infracambrian are reported as the dome and dyke in the south-east of study area in south Naein. Lithology combination of them is porphyry rhyolites. Parts of this unit are as tuff.

Two separate tectonic zones exists in the Chah Basheh mining region, one of these areas (area 1) is located in the 5 km from East Village Fakhrabad and the second (area 2) is in the SE of village Shureh. The importance of felsic host rocks for manganese mineralization and economic potential of it, petrology and probably environment of manganese are studied in this paper.

Central Iran zone is largest and most complication geological unit and it cover some parts of east Iran (north of Lut block). In this zone Precambrian rocks has outcrops only in the eastern parts and includes gneisses, amphibolites, different schist, marble, mygmatite and granite anatexy (Emami, 1996, Davoudzaddeh *et al.*, 1983, Nabavi, 1976, Nogole-Sadate, 1985) (Fig. 1).

The study area is located in 115 kilometers east of Isfahan and 20 km south of Naein and that geographic location is between 53°15 - 53°30 and 32°15 - 32°35. In the area south of Nain Felsic rocks from petrographic are rhyolite and mineralogical composition is containing large crystals of quartz, plagioclase with high rate of albite and alkali feldspar. These rocks from mineralogical composition are containing large crystals of quartz, plagioclase and alkali feldspar and from petrographic study are rhyolites. In this paper, we research about the Mineralogical Characteristics of Chah Basheh Felsic Volcanic Rocks in the S Naein.

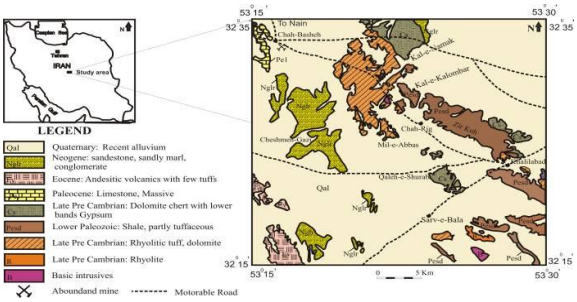


Fig. 1. Geological map of the Chah Basheh mine (adapted from Amidi *et al.*, 1979).

Research methodology

Sampling method

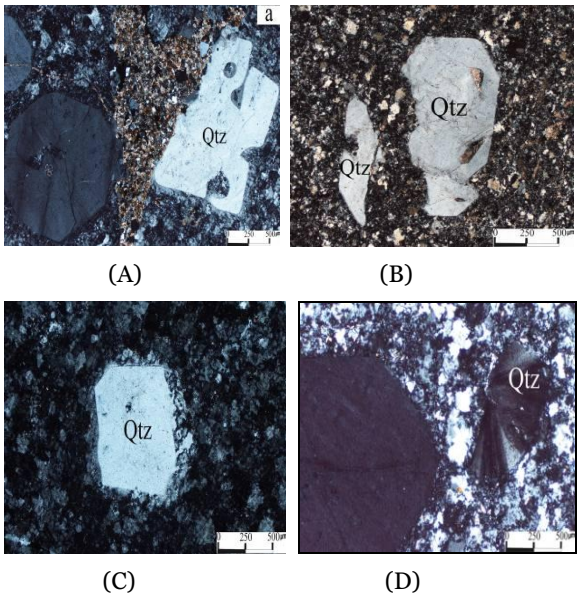
During the field visits was harvested of 100 rock samples have been collected from various parts of the study area. After studying the manual sample, 80 thin sections and 10 polish sections preparation and was studied with polarizing microscope.

Analysis method

Four samples of rhyolite rocks by method XRF in central lab Isfahan University (Iran) and seven samples of the study area by method ICP-MS in ACMELabs Canada was the chemical analysis. Also, different softwares especially Excel, Minpet and Igpet were used for analysis and drawing charts.

Results and discussions

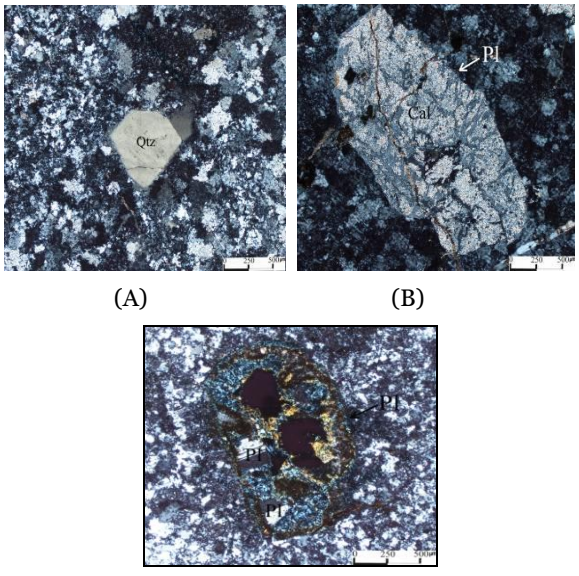
Felsic rocks from petrographic are rhyolite and mineralogical composition is containing large crystals of quartz, plagioclase with high rate of albite and alkali feldspar. These rocks from mineralogical composition are containing large crystals of quartz, plagioclase and alkali feldspar and from petrographic study are rhyolites. The quartz can be seen in the field as phenocrystal and also microcrystal. Quartz crystals are subhedral to euhedral and they are the most rock forming minerals. Large quantities of quartz have corrosion Gulf. This margin can be caused by a fast rise and sudden decrease pressure on the rhyolite magma (Shelly, 1993) (Fig 2).



(A) (B)

(C) (D)

Fig. 2. A and B) Large phenocryst quartz with corrosion Gulf, C) quartz having armor that calcite and secondary quartz sometimes has been filled rock fractures. D) Quartz has a wave off.



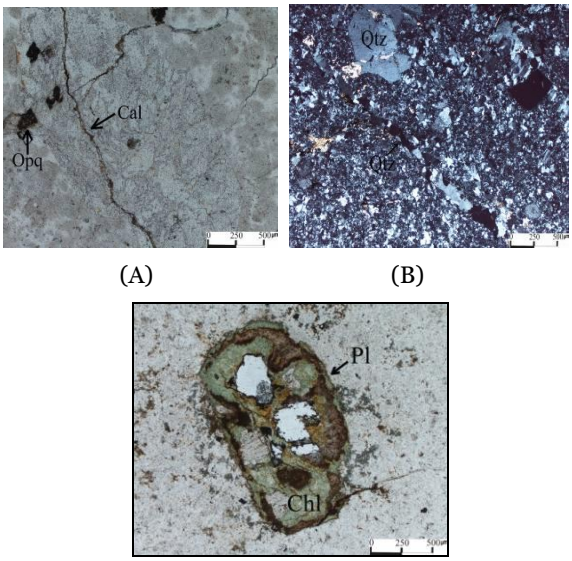
(A) (B)

(C)

Fig. 3. A) Alkaline feldspar in rocks as small crystals B, C) Plagioclases have been analyzed to secondary minerals.

After quartz, plagioclase is the most frequent phenocryst. Plagioclases often have euhedral phenocryst, sodice composition and albite to oligoclase combination. Most plagioclases are polysynthetic twins. In these rocks two generations of plagioclase can be seen. The first generation has large phenocryst of plagioclase which formed in the deep and the second generation of plagioclase microlites that occurred near the surface (Miskovic and Francis, 2006). This shows that magma is cooling fast and has polysynthetic twins (Shelly, 1993). Most plagioclases have been analyzed to secondary minerals. Most of them are serysyty and some of them is filled by minerals such as chlorite, penin (Mg, Fe, Al) $_{12}$ (Si, Al) $_{8}O_{20}$ (OH) $_{16}$ and calcite (Fig 3 B). Alkali feldspar finds as fine crystal and often is kaolinite (Fig 3 A).

The minerals opaque can be mentioned as most important minerals in the sub-sections. The secondary minerals in these sections include sersyt, chlorite (more penin type), epidote and calcite (middlemost 1985) (Fig. 4).

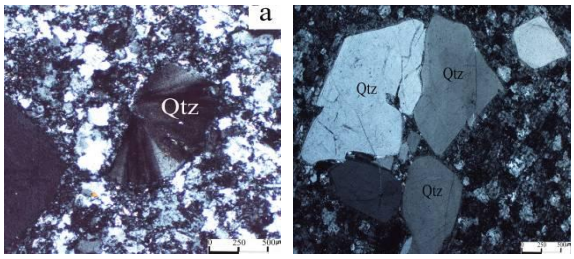


(A) (B)

(C)

Fig. 4. A and B) Secondary calcite and secondary quartz sometimes are filled rock fractures as veins. C) plagioclase chanded to chlorite.

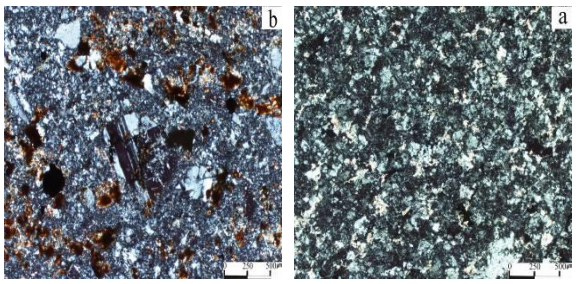
Rocks of this region have diversity in tissue but the porphyric texture is the dominant texture in this rocks and particular tissue are felsophyric and glomeroporphyric (Fig. 5).



(A) (B)

Fig. 5. A) Felsophyric texture B) Glomeroporphyric texture.

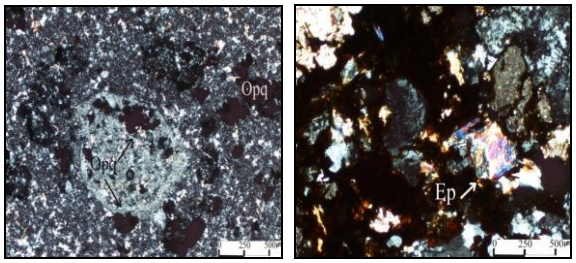
Tuff rocks have heterogeneous texture and color of them is gray, with white patches of plagioclase and calcite. The texture of these rocks is clastic and in division of rocks are in lytic and glass tuff. A small amount of phenocrysts can be seen in some samples. Tuff rocks have quartz and plagioclase which most plagioclases are from albite type (Fig 6).



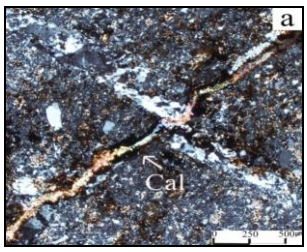
(A) (B)

Fig. 6. Tuffs of the Chah Bashe region.

The secondary minerals in tuff rocks are epidote, calcite and opaque minerals. Calcite veins are visible in this section. The field is made of a fine grain ash tuff which was recrystallized (Shelly, 1993). Secondary epidote mainly made from analysis of plagioclase, amphibole and biotite and mostly restricted to the veins, filling the joints and fractures (Fig 7).



(A) (B)



(C)

Fig. 7. A) The secondary minerals in tuff rocks, opaque minerals B) epidote C) calcite.

Conclusion

Felsic volcanic rocks in the study area in terms of mineralogy and chemical composition are classified in rhyolite groups. These rocks from mineralogical composition are containing large crystals of quartz, plagioclase and alkali feldspar. The quartz can be seen in the field as phenocrystal and also microcrystal. Quartz crystals are subhedral to euhedral. Plagioclases often have euhedral phenocryst, sodice composition and albite to oligoclase combination. Most plagioclases are polysynthetic twins. Alkali feldspar changed to kaolinite. The particular textures in these rocks are felsophyric and glomeroporphyric. There are features at phenocrysts such as the corrosion Gulf and resorption in quartz, corrosion of plagioclase which indicate a chemical imbalance and magma rising, rapid reduction in pressure and raised of magma. These show an important role of continental crust or magma mixing in this region (Raymond, 2002).

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