

## The cheshmeh Noghreh abandoned mine: Type of Epithermal Au-Cu Mineralization in the Northwest of kashmar, Iran

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### Abstract

*Study area is located 20 km northwest of Kashmar and about 4 km of Kalateh Taimour in Khorasan Razavi province. The study area is part of tertiary volcanic plutonic belt north of Daruneh fault and its situation in tectonic Inliers between two important active faults, Daruneh and Taknar. Volcanic rocks are mainly intermediate to acid pyroclastic type. They formed during early tertiary time. Quartz monzonite, Quartz diorite and microdiorite are intruded some time in midtertiary time.*

*Mineralization is mainly control by fault system. Several mineralization faults are being discovered. Open-space filling feature are abundant. In study area disseminate and stock work mineralization is abundant. Amount of sulphide minerals is very small. Ancient mining is present in the district. In this belt, a new method of image processing is use for enhancing the alteration zones. Propylitic, Sericitic and Argilitic are the main alteration type. Minor Silicified is found in some areas. Cheshmeh Noghreh is an (Epithermal Au-Cu Low Sulphidation) type deposit. The ore bearing fluid was Low Sulphide.*

**Keywords:** Remote sensing; Epithermal Au-Cu; Kashmar;

### Introduction

Klath Taimor region in South Khorasan Razavi province, and 20 kilometers northwest of Kashmar is that during 1375-1370 by local exploration geochemical of Semnan-Torbat Heydarieh by Geological survey of Iran with Chinese experts as one of the gold potential was introduced [2, 1]. He works within the old mining pit and trench areas Cheshmeh noghreh, Bagh ghazi and Sartakht-e- mine that appears to be obtained for copper, gold and silver is interest [3]. Previous studies in this area, including mapping the geology 1:20000 and 1:5000, geochemical studies in method of way channel sediments and is digging trenches [4, 3]. In this study the extent and importance due to the alteration in the region, major studies on the region alteration areas is done.

### Regional geological setting

This is located on the sidelines of the North Central Iran on basis on major structural division of sedimentary [5]. Look under the tectonic zones of Iran, area in South Central zones Sabzevar among large fault of Daroone and fault Taknar (Rivash) is that some of Geology from the subject to name brand Taknar zone. movement of the Cenozoic tectonic cause melting in the system, especially in the east Taknar is and why the border with the eastern zone Taknar faces ambiguity but its location west of dealing with Rivash fault with Darooneh fault is. the window Daroune Taknar specific erosion to be (Figure 1) [6]. Muller and Walter erosion Taknar the window structure as a labyrinth introduced anticline that has its syncline and in some parts by system of normal and reverse have mixed. Compression deformation of rocks and Paleozoic lower kimerian it event former are attributed [7]. Lindbergh and Hagen

Jakvoobs opinion before the Paleocene deformation probably not so important and probably the first type of tectonic events of uplifting block and fault [8]. According to Ismaile and colleagues, Bornord granite tectonic environment in drought of uplifting type a continental roots (CEUG) and the category formed by granite is type A. This granite in rift environment within the continent (WPG) formed which never come to birth and oceanic stage of the melting of crust rock the continent to there has been [10].

Soltani believe there  $Sr^{86}/Sr^{87}$  high initial values (0.75008- 0.70757) and negative values  $\epsilon Nd$  (-5.20 to -1.41) that the magma manufacturers Bornord widely with  $Sr^{87}$  derived from Stone Find more Mafic old the continental crust, or magma contaminated by the melting of the continental crust rocks Felsic Old is produce. Granite type I and he is Bornord knows [11]. Bornord what defines a granite is actually set stone of various acidic and enough granite - granodiorite - tonalite, is Gabrodiorite [12]. Granite had very bright colors and is medium to coarse crystals. While the dark diorite more, the average yield to be granule are. The distinctive granite Razzagh manesh of type alkali granite and diorite Hornblende is of type.

### **Geology of the area**

Study area in northern fault zone of volcanic influence is Khaf-Drooneh. Referring to the geological map of 1:100000 Kashmar, lithology region was young, and includes volcanic rock, combining pyroclastic acidic to be intermediate [13]. The oldest lithology region, is the early Eocene that lower. Set volcanic rock outcrops in the region most Tertiary have. Volcanic rock composition basalt andesite, Latite thracite, Dacite, and Rhyodacite with the shape of lava, tuff, Agglomerate and Lappily. Based on field and laboratory studies identify several mass influences. Mass piercing small outcrops are on the ground and form is stockwork. Influence Hornblende biotite Monzodiorite include quartz porphyry, Quartz biotite Monzodiorite porphyry, Quartz diorite porphyry and Microdiorite [14].

### **Petrology**

Extrusive rocks: the oldest of regional rock is andesite basalt and in the West to be seen within the borders of tape and continued with be seen (Figure 2). North West - South East are direction of them. They have texture of porphyry and about 30-25% of phenocryst. Coarse crystals including Plagioclase 20%, less than 7% alkali feldspar, pyroxene 10-5%. Andesite, and latite thracite. Alternatively most outcrops are at the center of the region (Figure 2). Posts stone porphyry texture and had an average glomeroporphyritic 15-7% are phenocryst. Large size crystals of 0.5 to 2 mm vary. Large crystals often include Plagioclase, alkali feldspar, pyroxene Hornblende and less seen to be [14]. Dacite, Rhyodacite have fewer outcrops observed in the North East (Figure 2). They have porphyry - vitrophiry texture. About 9 to 7% are phenocrysts. The average size of the phenocrysts is 1 – 0.15 mm [15]. Pyroclastic stones: they are porphyry, glass, pyroclastic. East Zone area, size, parts inside roar Lithic crystal tuff, sometimes to 30 mm meters appear. The roar to be fromed masses. Green layer is seen in northern area is Tuffite in South West Abandoned Mine Silver spring, the element with the shale and sandstone and andesite lava being seen. Layered with low slope of 17.5 degrees along the North West - South East will be seen [15].

Intrusive rocks: Most outcrops of the mass sub volcanic Hornblende biotite quartz porphyry in the north area Monzodiorite seen that we are dull topography (Figure 2). They have about

25-20% phenocryst. Phenocryst size between 0.3 to 7 millimeters varies. The center of mass phenocryst Hornblende sometimes more than 7 millimeters are growing and western borders to mass into quartz porphyry biotite monzodiorite Hornblende less than that amount and size of biotite phenocryst is smaller. Percent of opaque minerals (pyrite) that form the surface spray stone is seen to be 2 to 3 percent to reach. Outcrops of quartz diorite porphyry mass subtype volcanic seen in the West region are (Figure 2). Field and the percentage of ophitic phenocryst much more and in 35 to 25% is. Phenocryst with the average size of 2.5 - 0.2 millimeter is seen [14]. Mass influence zone along the microdiorite has several small outcrops (Figure 2). It is granular texture. Plagioclases in average size of 0.3 mm. Their frequency of 20 to 30 percent seen in Mafic mineral type and clinopyroxene mafic 2 to 3 percent of the lot there. Opaque mineral 1.5 percent and the yield spread as seen are fine. The average size opaque minerals (pyrite) in the limit 0.3 mm are [14].

### **Processing the satellite images**

Processing to alteration in the range of halo desired wavelength use of VNIR and SWIR [16] the images ETM<sup>+</sup>7, statistical operations to select more contrast bands, band ratios and analysis techniques component of. The main performance spaces, RGB and ISH performed similar to the results of better detection zone alteration and development of mineralization has had. In this study, ER Mapper 6.3 software for data processing the scene transition information call 160-row 35 window to the approximate area of 1600 square kilometers (first quarter sheet quarter sheet quarter 1:100.000 and 1:100.000 Kashmar Feyz Abad ) has been selected [17].

Before image processing, statistical operations (arithmetic mean, median, standard deviation, values and special covariance) Histogram calculated and uniformity were performed Tuesday to pick the best bands wings, combined with the most color information was created. bands 5, 3 and 7 have the highest standard deviation.

In ratio images changes relatively subtle spectral phenomenon Game better images Home appears to be due to the elimination of factors and parameters that are undesirable, such as topography and depending on region and type of application should be divided into gangs scurry appropriate best income results is [18]. Therefore, using the known areas within the zones which were specific alteration exact proportion suitable images were determined. Rates of these images, very sharp color separation in regions alteration cheshmeh noghreh, keeping clean areas from areas of carbonate clay and very clear demarcation between the halo with the units to be litho logic [17]. Pictures of subtractive method applied in their surroundings, but resolution was not possible and in border areas halo alteration be seen that all here is to a size.

### **Alteration and mineralization**

Images processed Landsat ETM<sup>+</sup>, areas of alteration have spread extensively within the study. Span alteration region Northwest toward South east. Resolution to the existing mineral zone of altration, the satellite special methods of processing and mineral Garosite, Chlorite, Sericitic, Kaolinite, Quartz, secondary iron oxides were identified. Types of zones sericitic, Argillic, Propylitic and Silicified are observed. Most outcrops in the North and West Zone propylitic study area is seen to be. The extent of outcrops in the region to review reaches 1600

km<sup>2</sup>. Minerals in this zone that is seen more epidote type, chlorite, zoesite and less carbonation with albite and is. Epidote and chlorite both scattered and in the text of the stones seen filling the empty space is. Vein lets available in this zone include quartz + chlorite, quartz + epidote + calcite that quartz observe with shoulder texture in margins and in the middle of vein let chlorite + epidote be seen. Eocene andesite basalt outcrops in the West region has a low Intensity alteration and a total rock epidote (7 to 10%) + zoesite (less than 2%) + calcite (2 to 5%) + clay is seen generation is without minerals. propylitic zone of the Stone Sub volcanic Hornblende biotite quartz porphyry and quartz diorite porphyry Monzodiorite the north is a epidote (3 to 15%) + chlorite (2 to 10%) + zoesite (less than 0.5 %) seen with sulfide minerals as pyrite type of jet and stock work be seen. Quartz zone pattern around the zone specified by the extent of outcrops approximately 0.05 km<sup>2</sup> reaches. Most of the outcrops in the region among the pyroclastic rocks in cheshmeh nogreh. The most important mineral. This zone of quartz that two forms semi vein (space filling) and diffuse (community secondary quartz crystals in the text) to be stone seen. Value of this mineral in the 35 to 50 percent Rgchh varies. Mineral filler in building space solution to the quartz crystals, quartz grain with medium coarse texture mosaic semi vein growth among sulfide solution and then passing inside semi vein crystals to form half the significant pyrite to have left . Most of these oxide sulfide crystals in size from small 0.03 to 0.2 millimeters can be accessed. Amount of secondary oxides result in sulfide ore in about 1.5% to reaches. Semi vein in number of large stones, and sometimes semi vein width to 10 to 15 millimeters appear. Semi vein among parts of the host rock that is sericitic; to Eye eats. Quartz in the two forms border community fine grain quartz crystals by mill and another in the crystallization of this rock is seen to be. sericitic zone with outcrops approximately 0.45 kilometer area in the region had the most and includes sericitic, quartz, pyrite and clay minerals to be. In the northern zone sericitic range, feldspar in 5 to 20 percent of sericitic has become sometimes amount to 30% in the text sericitic Stone has spread. Secondary quartz in about 7 to 10 percent. Semi vein quartz is rarely seen. In much less than 0.5% sulfide oxide mineralization in Semi vein there. Minerals - in the text of opaque and the oxide ore is scattered and of 0.5 to less than 1% is a variable. Mineralization in sericitic zone in south west, as space fillers and dispersed among the hydrothermal tuff seen in the microscopy studies and appear to be making mineralization available to the alteration of parts sericitic rocks is no communication. Argillic zone to sericitic zone is less development and more sericitic in North and West region are seen to be. The area of this zone to within 0.15 km<sup>2</sup> reaches. This zone as carbonate + clay development in the region had minor sericitic and most secondary quartz has semi vein small in the field is observed. Amount of secondary oxides in this zone often less than 0.1% to reaches.

In alternation areas, mineralization is not syngenetic type and distribution of mineralization observed silicified and Propylitic is higher. The most important and abundant pyrite most sulfide is identified early. Percent, and many mineralization sulfide zone is limited and its distribution is discontinuous. Amount of primary sulfide is less than 3 percent. pyrite observe to 2 type grains of coarse grain and fine grain that stock work, joint space filler and disseminated field is composed of rock. Pyrite size of 0.02 to 2.3 mm vary. Semi vein width of 0.01 to average 0.5 mm appear. Intensity oxidation of pyrite in zone is high and sometimes

are completely oxidized. Semi vein of Quartz + pyrite + iron oxide + carbonate, Chlorite + quartz + pyrite, quartz, iron oxide cryptocrystalline + quartz + Chlorite quartz + Epidote be seen. Semi vein in quartz + pyrite located in the south region, on the sidelines of quartz grains and pyrite to form be seen in the center. mineralization more in Oxidant zone including iron oxides, copper carbonate (Malachite, Azurite) the secondary level is ground.

### Conclusion

Land navigation based on the mass of the first semi piercing deep in Identification, which include Hornblende biotite quartz diorite porphyry biotite quartz diorite porphyry, quartz diorite porphyry and diorite are micro that Major outcrops of the North and North West region is.

New method for processing the Landsat satellite images ETM7<sup>+</sup> for better disclosure and alteration halo Khaf the belt - Darooneh is presented. Alteration to identify areas within the study, after statistical smoothing Histogram the compounds in exact proportion were proposed:

$$ISH = [PC_1 (5, 4, 1) - PC_2 (5, 4, 1) - PC_3 (5, 1, 7)]$$

$$RGB = (4/3-5-5/7), (5/7-4/3-4/7), (5/2-1/4-5/7)$$

The diversity and expansion of processing images alteration in study area was land navigation that it confirms to. Processing of satellite images aster as a fault in the mineralization approved. Main strike of important fault is Northwest.

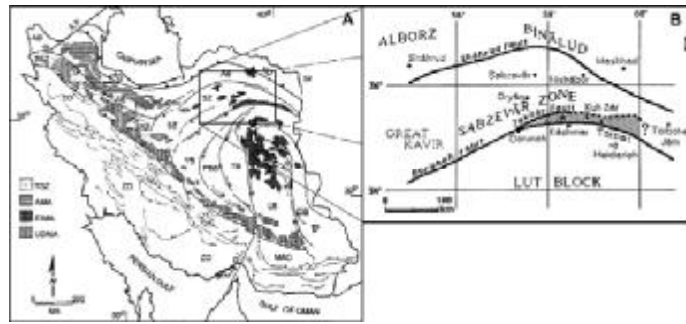
Degree and severity of different alteration zones identified, pattern of fragmentation in the region has been determined. Based on this diversity and alteration in the region, including high propylitic, silicified, sericitic and argillic alteration. Major outcrops in the north propylitic alteration zone and quartz alteration in the North and the South East region with the sulfide minerals is building. Evidence from microscope studies of areas semi vein alteration is apparently more than two times the area affected by soluble mineral instrument has been with the interval has been.

Despite the large area of alteration in the region, vast mineral building is limited. Percent frequency in the range of sulfide mineralization studies and more limited form of jet stockwork and space is filling. The pattern alteration, non-uniform distribution of mineralization and percent low birth sulfide minerals, it system can further the region of hydrothermal copper-gold deposit type low sulphidation type occurs.

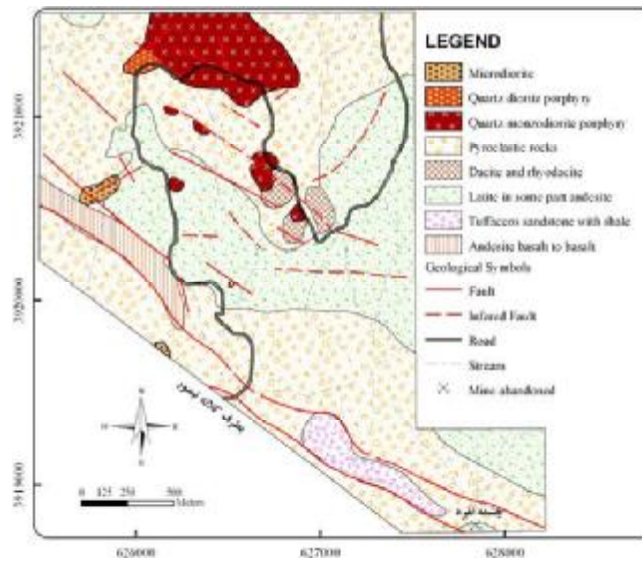
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**Fig. 1. A) Index map showing the main tectonic elements of Iran (After Alavi et al. (1997)). Abbreviations: AB, Alborz Belt; AF, Aras Fault; AMA, Alborz Magmatic Belt; EIMA, East Iranian Magmatic Belt; KD, Kopeh Dagh Zone; LB, Lut Block; MAC, Makran Accretionary Complex; NRITF, Non-rotation-related intercontinental transfer fault; NTA-ACS, Neo-Tethyan arc-arc collisional suture; O.L., Oman Line; PBB, Poasht Badam Block; RRITF, rotation-related intercontinental transfer fault; SZ, Sabzevar Zone; TB, Tabas Block; TSZ, Tabriz-Saveh Zone; UDMA, Urumieh-Dokhtar Magmatic Arc; YB, Yazd Block; ZO, Zagros Orogen. (B) Map showing locations of cheshmeh noghreh.**



**Fig. 2. Geology map of cheshmeh noghreh.**