Summer 2020, Vol 10 (2): 235-251 J. Adv. Appl. Geol. OPEN ACCESS

Geochemistry, mineralogy, and genesis of Darbe Behesht iron-copper deposit, Dehaj-Sardoiye subzone, Kerman Province, Iran

Ghodratollah Rostami Paydar [1*], Mansour Adelpour [2]

1- Department of Geology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran
2- Department of Geology, Faculty of Earth Sciences, Shahid Chamran University of Ahvaz, Ahvaz, Iran

Keywords: Geochemistry, Mineralogy, Fe-Cu skarn, Darbe Behesht, Kerman

1-Introduction

Darbe Behesht Iron - copper deposit is located in the Dehaj-Sardoiye subzone of Urumieh-Dokhtar Magmatic Arc (UDMA) in the Kerman region. The UDMA zone is often composed of calc-alkaline intrusive and volcanic rocks and associated pyroclastic materials (Alimohammadi et al., 2015). Many authors discussed the tectonic features of this volcano-plutonic belt (eg., Shahabpour, 2005, 2007). Most of the copper deposits are located in the southern part of the arc, known as the Dehaj-Sarduiyeh arc or the Kerman copper belt (Mirzababaei et al., 2011, 2016; Shafiei et al., 2009). This study investigates the geochemistry, tectonic position of volcanic rocks containing Eocene Fe-Cu mineralization, paragenesis, and alteration. So we focus on the field observations, lithology, and ore characterization of Darbe Behesht as a prominent example of the IOCG deposits in the southern part of the Dehaj-Sardoiye belt in Iran.

2-Methodology

During field surveys, the geological and structural framework of the area was reviewed, and at the same time, the relationship between mineralization and intrusive rocks were determined. The samples were collected from the study area focusing on identifying some characteristics of the host rock and ore textures (13 thin sections and 12 polished sections). Ten samples were analyzed for major elements using x-ray fluorescence (XRF) in the Zar-Azma Laboratory, Mashhad, Iran. Ten samples were sent to the West Lab, Australian Laboratory for trace and rare earth elements (REE) analysis using Inductively- Coupled Plasma-Mass Spectrometry (ICP-MS).

3- Result and discussion

The area is covered by Eocene volcanic rocks composed mainly of andesite, trachy-andesite, basalt, and pyroclastic rocks (various types of tuffs and agglomerate). Based on major, trace, and REE elements, these rocks are very similar to calc-alkaline lava with metaluminous to peraluminous nature. Enrichment of LILE (Such as K, U, Sr, Rb, Th, Pb, and Ba) and LREE relative to HFSE (Such as Zr, Y, Ti, and Nb) and HREE, high ratios of K_2O/Rb and FeO/Mg reveal that the rocks under study were originated in an active continental margin subduction-related tectonic setting. Volcanic rocks affected by hydrothermal fluids, which lead to the occurrence of propylitic alteration, silicification with skarn alteration. Propylitic alteration comprises dominant alteration in the area and is characterized by epidote, chlorite and calcite mineral assemblages. Silicification is mainly cropped out in both adjacent to mineralized veins, and to a lesser amount, as pervasive silica. Argillic alteration is locally present within the surface outcrops. Mineralization is mainly controlled by a system of extensional faults and joints.

In most cases, mineralization is hosted by pyroclastic units (especially agglomerate) or in the contact between agglomerate and andesitic rocks. The presence of granodiorite intrusive masses in the area containing large amounts of hydrous mafic minerals (including amphibole and less biotite) and the presence of the skarn zone produced by magmatic fluids indicate that the mineralization event related to the injection of granodiorite intrusive into country rocks. Magnetite and chalcopyrite are the primary ore minerals. Secondary minerals from

*Corresponding author: rostamigsi2006@gmail.com

DOI: 10.22055/AAG.2019.15229
Received 2018-11-10
Accepted 2019-11-27

weathering are goethite, hematite, limonite, malachite, and azurite. The ore textures and structures are open space-filling, disseminated, vein-veinlet, and replacement. Fluid fluxes into faults, fractures, and weaknesses of the rock units have caused ore mineralization in the specified trends as same as normal faults systems.

4-Conclusion

According to the tectonic setting, geochemical study, and the extensional fault mechanisms, which are lucid together extensional back-arc basin in the Dehaj-Sardoiye subzone within UDMA subduction zone. Two critical stages could be separated for mineralization. The first one is the hypogene mineralization phase, and the other one is the supergene phase. The first stage is accompanied by the generation of magnetite in volcanic and pyroclastic rocks and second ones related to reduction fluids that caused copper mineralization. Based on geology, mineralization, geochemistry data, and the presence of skarn, the mineralization mechanism of the Darbe Behesht area is comparable with the North Semnan deposits, and we can be classified as a proximal subclass of calc-alkaline type of IOCG deposits, e.g., skarn. Detailed studies, including fluid inclusion, electron microprobe, and stable isotopic investigations, can be further applied to examine the type of mineralization in the Darbe Behesht area.

Acknowledgments

The authors are grateful to the Journal of Advanced Applied Geology reviewers, and the editor is also thanked for their constructive suggestions on the manuscript.

References

Alimohammadi, M., Alirezaei, S., Kontak, D., 2015. Application of ASTER data for exploration of porphyry copper deposits: Acase study of Daraloo–Sarmeshk area, southern part of the Kerman copper belt, Iran. Ore Geology Reviews 70, 290–304.

Mirzababaei G., 2011. Relationship between the structural and tectonic factors and mineralization in Dehaj-Sarduieh copper belt; Kerman, SE Iran (in Farsi), 128p.

Mirzababaei, G., Shahabpour, J., Zarasvandi, A., Hayatolgheyb, S.M., 2016. Structural Controls on Cu Metallogenesis in the Dehaj Area, Kerman Porphyry Copper Belt, Iran: A Remote Sensing Perspective. Journal of Sciences 27, 253–267.

Shafiei, B., Haschke, M., Shahabpour, J., 2009. Recycling of orogenic arc crust triggers porphyry Cu mineralization in Kerman Cenozoic arc rocks, southeastern Iran. Mineralium Deposita 44, 265–283.

Shahabpour J., 2007. Island-arc affinity of the Central Iranian Volcanic Belt. Asian Earth Sciences 30, 652-665.

Shahabpour, J., 2005. Tectonic evolution of the orogenic belt in the region located between Kerman and Neyriz. Journal of Asian Earth Sciences 24, 405–417.