Journal of Economic Geology
Vol. 9, No. 1 (2017)
ISSN 2008-7306

مجله زمین‌شناسی اقتصادی
جلد 9، شماره 1 (سال 1396)
صفحات 21 و 22

Cu-Ag Besshi type volcanogenic massive sulfide mineralization in the Late Cretaceous volcano- sedimentary sequence: the case of Garmabe Paein deposit, southeast of Shahrood

Majid Tashi, Fardin Mousivand* and Habibollah Ghasemi

Department Petrology and Economic Geology, Faculty of Earth Sciences, Shahrood University of Technology, Shahrood, Iran

Submitted: Jan. 5, 2015
Accepted: Jan. 23, 2016

Keywords: *Volcanogenic massive sulfide, Besshi type, Garmabe Paein, Late Cretaceous, Sabzevar subzone*

Introduction

Iran hosts numerous types of Volcanogenic massive sulfide (VMS) deposits that occur within different tectonic assemblages and have formed at discrete time periods (Mousivand et al. 2008). The Sabzevar zone hosts several VMS deposits including the Nudeh Cu-Ag deposit (Maghfouri, 2012) and some deposits in the Kharturan area (Tashi et al., 2014), and the Kharturan area locates in the Sabzevar subzone of the Central East Iranian Microcontinent. The Sabzevar subzone mainly involves Mesozoic and Cenozoic rock unites. The Late Cretaceous ophiolite mellanges and volcano-sedimentary sequences have high extension in the Subzone. Based on Rossetti (Rossetti et al. 2010), the Cretaceous rock units were formed in a back-arc setting due to subduction of the Neo-Tethyan oceanic crust beneath the Iranian plate. The exposed rock units of the Kharturan area from bottom to top are dominated by Early Cretaceous, orbitolina-bearing massive limestone, dacitic-andesitic volcanics and related volcaniclastic rocks، chert and radiolarite and Late Cretaceous globotrunkana- bearing limestone, paleocene polygenic conglomerate consisting of the Cretaceous volcanics and limestone pebbles (equal to the Kerman conglomerate), and Pliocene weakly-cemented polygenic conglomerate horizon. The Garmabe Paein copper-silver deposit and the Asbkeshan deposit and a few occurrences, are located at 290 km southeast of Shahrood and they have occurred within the Upper Cretaceous volcano-sedimentary sequence in the Sabzevar subzone. The aim of this study is to discuss the genesis of the Garmabe Paein deposit based on geological, textural and structural, mineralogical and geochemical evidence.

Materials and methods

A field study and sampling was performed during the year 2013. During the field observations, 94 rock samples were collected from the study area, and 45 thin sections were prepared and studied using a polarizing microscope. Also, 5 samples for the XRD method, 21 samples for the XRF and ICP-OES methods were analyzed in the Iranian Mines and Mining Industries Development and Renovation (IMIDRO) Company labs.

Results

The Garmabe Paein copper-silver deposit is located in the Sabzevar subzone of the Late Cretaceous Volcanio-sedimentary sequence. This mineralization occurred as stratiform and stratabound in a specific stratigraphic horizon. The host rocks of mineralization are andesitic-dacitic volcanic rocks and their related volcaniclastics. The mineralization occurred as four ore facies, from footwall to hanging wall: vein-veinlet-s (stringer), massive, bedded and exhalites. Ore textures and structures involve massive, semi-massive, laminated, banded, vein-veinlets, replacement and open space fillings. Minerlogically, the deposit contains primary minerals such as pyrite, chalcopyrite and magnetite, and secondary minerals such as native copper, cuprite, covellite, malachite and Fe-Mn oxides. Wallrock alterations are dominated by chloritic and minor siliceous and argillic. The highest grades of gold and silver in the deposit are

*Corresponding authors Email: mousivand@shahroodut.ac.ir
DOI: 10.22067/econg.v9i1.43062

1 and 19 grams per ton, respectively. The amounts of Zn, Pb, Au, As, Ag and Mn increase from the stringer to the upper part of the deposit. It seems that the occurrence of submarine volcanic activity in the Late Cretaceous back- arc basin have resulted in the deposition of this Besshi type massive sulfide deposit.

Discussion

Most of characteristics of the Garmabe Paein Cu-Ag deposit including tectonic setting, geological environment, host rocks, geometry, textural and structural, mineralogical and geochemical features, are very similar to those of the Besshi- or pelitic mafic-type (Franklin et al., 2005) volcanogenic massive sulfide (VMS) deposits.

Acknowledgements

The authors are grateful to the University of Shahrood Grant Commission for research funding and the IMIDRO Company.

References

Franklin, J.M., Gibson, H.L., Galley, A.G. and Jonasson, I.R., 2005. Volcanogenic massive sulfide deposits. In: J.W. Hedenquist, J.F.H. Thompson, R.J. Goldfarb and J.P. Richads (Editors), Economic Geology 100th Anniversary Volume. Society of Economic Geologists, Littleton, Colorado, pp.523-560.

Maghfouri, S., 2012. Geology, mineralogy, geochemistry and genesis of Cu mineralization Within Late Cretaceous Volcano- sedimentary sequence in southwest of Sabzevar, with emphasis on the Nudeh deposit. M.Sc. Thesis, Tarbit Modares University, Tehran, Iran, 312 pp. (In Persian with English abstract)

Mousivand, F., Rastad, E. and Peter, J.M., 2008. An overview of volcanogenic massive sulfide deposits of Iran. 33rd International Geology Congress Oslo, Oslo, Norway.

Rossetti, F., Nasrabady, M., Vignaroli, G., Theye, T., Gerdes, A., Razavi, M. and MoinVaziri, H., 2010. Early Cretaceous migmatitic mafic granulites from the Sabzevar range (NE Iran): implications for the closure of the Mesozoic peri- Tethyan oceans in central Iran. Journal of Terra Nova, 22(1): 26-34.

Tashi, M., Mousivand, F. and Ghasemi, H., 2014. Volcanogenic massive sulfide Cu-Ag mineralization in the Kharturan area, southeast of Shahrood. 1th International Workshop on Tethyan Orogenesis and Metallogeny in Asia and Silk Road Higher Education Cooperation Forum, China University of Geosciences (Wuhan), Wuhan, China.