Journal of Economic Geology
Vol. 12, No. 2 (2020)
ISSN 2008-7306

زمین‌شناسی اقتصادی
جلد ۱۲، شماره ۲ (سال ۱۳۹۹)
صفحات ۱۳ و ۱۴

The role of right-lateral shear zone and folding-related fractures in development of Zarshuran gold deposit, Takht-e-Soleyman complex, northern Takab

Reza Alipoor*, Ebrahim Tale Fazel and Mahdi Farhani Moghadam

Department of Geology, Faculty of Basic Sceinces, Bu-Ali Sina University, Hamedan, Iran

Submitted: Oct. 02, 2018
Accepted: Mar. 10, 2019

Keywords: *Ore deposit, Anticline, Fractal, Gold, Takab fault, Zarshuran*

Introduction

The Zarshuran gold deposit is located in the Takht-e-Soleyman complex, NW Iran. It is formed in the Iman Khan NW-trending anticline (Mehrabi et al., 1999; Samimi, 1992). The rock units at Zarshuran mainly consist of Precambrian sequence (Iman Khan schist, Chaldaq limestone and Zarshuran black shale) which are overlain by Cambro-Ordovician limestone and Oligo-Miocene formations. Gold mineralization in the Zarshuran area occurs associated with jasperoid alteration within the Zarshuran black shale and Chaldaq carbonate rocks (Bazdar et al., 2015). The deposition and transportation of mineralized fluids from buried igneous rocks, faulting and fractures in basement and covered units, physico-chemical exchange in site of deposition, and hydrothermal alterations are the most important controls on gold mineralization at Zarshuran. There is a structural control on mineralization and ore deposition with respect to the alignment of gold mineralization along the NW- and NE-trending faults at Zarshuran. The mechanism of deformation in the studied area has been controlled by two sets of main fault systems. The early system is the NW-trending steeply-dipping right-lateral strike-slip faults with a reverse component and the late systems are the NE-trending faults that have been displaced by the early system. In this study, the relationship between fractures and structural lineaments with gold mineralization in the Zarshuran gold deposit was studied by remote sensing methods and fractal analysis. Then, development of extension and compressive structures of the Imam Khananticline in the right-lateral shear zone and role of fractures related folding in mineralization were investigated. It revealed that the spatial distribution of the fractures systems in folding structures is related to the kinematic evolution and geometry of folding.

Material and methods

Relations between mineralization and fracture systems are interpreted using field observations, extraction of lineaments and fractal analysis in this study. The lineaments map of the study area were extracted using appropriate algorithms of spatial data (STA algorithm), using Landsat 8 satellite (ETM^+ sensor) images by semi-automatic method. Also, fractal dimensions in six parts of the area were calculated for faults and structural lineaments using the square method, log-log charts and related fractal analysis. A total of 75 samples were collected from trenches and surface outcrops. Then, analysis was performed for measurement of base and precious metal assays by inductively coupled plasma-optical emission spectroscopy (ICP-OES) in the Kanpazhuh laboratory (Tehran, Iran). Geochemical anomalies were reported by field observations and geological maps, and the extension and compressive structures associated to right-lateral shear zones were studied after determining the areas with high fractures density. Then, the relations between mineralization and transverse and longitudinal fractures related to folding in the Iman Khan anticline are investigated and a schematic model

*Corresponding author Email: rezaalipoor116@gmail.com
DOI: https://doi.org/10.22067/econg.v12i2.75702

of the ore formation related to the folded structure are presented.

Results and discussion

The study area is first divided into six parts (a to f) in order to calculate the fractal dimensions of the lineaments and faults. The most frequent trends of the lineaments and faults is at about N20E to N75E and N30E to N85E, respectively. In order to study the relation between fractal dimensions of faults and lineaments with the distribution of gold in study area, the fault and lineament maps are somehow combined with the gold distribution map. In parts of the study area where the fractal dimensions of faults and lineaments show high values, gold concentration is also high. This indicates a structural relationship between the density of lineaments and faults of the study area with distribution of gold mineralization. The most important fault structure affecting the study area is the Takab fault zone with NNW-SSE trend and a length of about 80 km. The Takab fault zone and its related fractures play a major role in transport of hydrothermal fluids, and the biometric data show that these activities have continued from Miocene to date (Mehrabi et al., 1999; Daliran, 2008). The right-lateral strike-slip movement of the Takab fault has led to displacement of the rock units in study area. Also, this right-lateral movements caused formation of fractures with different trends and compressive and extensional structures as folding, reverse faulting and normal fractures. The Iman Khan anticline hosting the Zarshuran gold deposit is one of the main structures related to the Takab fault movement. The fractures related to this folded structure have played an important role in transporting the hydrothermal fluids. The fracture systems related to the Iman Khan anticline, is generally of longitudinal and transverse type. Therefore, after the slab break-off event and formation of a compressive structure due to the strike-slip movement of the Takab fault, the faults served as pathways to the ore-forming fluids. All evidences shows that the longitudinal fractures have an important role in the mineralization along the Iman Khan anticline, although the thickness of the mineralized zone increases at the intersection of longitudinal and transverse fractures.

References

Bazdar, H., Fattahi, H. and Ghadimi, F., 2015. Hybrid ANN with Invasive Weed Optimization Algorithm, a New Technique for Prediction of Gold and Silver in Zarshuran Gold Deposit, Iran. Journal of Tethys, 3(3): 273–286.

Daliran, F., 2008. The carbonate rock-hosted epithermal gold deposit of Agdarreh, Takab geothermal field, NW Iran hydrothermal alteration and mineralization. Mineralium Deposita, 43(4): 383–404.

Mehrabi, B., Yardley, B.W.D. and Cann, J.R., 1999. Sediment-hosted disseminated gold mineralization at Zarshuran, NW Iran. Mineralium Deposita, 34(7): 673–696.

Samimi, M., 1992. Recognisance and preliminary exploration in the Zarshuran. Kavoshgaran Consulting Engineers Company, Tehran, 220 pp. (in Persian)