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Interpretation of geophysical and geological data of Gonharan lead and zinc exploration area (east of Daran City, Isfahan Province)

Sobhan Karami[1]; Seyed Vahid Shahrokhi[2]; Tahir Farhadinejad[3]; Mustafa Esmaili Vardanjani[4]; MohamadAli Aliabadi[5]

1. PhD Student: Faculty of Basic Sciences, Economic Geology, Mahallat Branch, Islamic Azad University, Mahallat, Iran
2. Associate Professor: Department of Geology, Khorramabad Baranch, Islamic Azad University, Khorramabad, Iran
3. Assistant Professor: Agricultural Research, Education and Extension Organization, Khorramabad, Iran
4. Atin Madan Media Co., Isfahan, Iran
5. Department of Geology, Mahallat Branch, Islamic Azad University, Mahallat, Iran

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Corresponding author: vahid.shahrokhi@gmail.com

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Extended Abstract

Summary

Gonharan lead and zinc area is situated in the carbonate part of Sanandaj-Sirjan zone, with early Cretaceous massive limestone host rock. Mineralization is mainly associated with dolomitic-siliceous alteration. The mineralized dolomitized sections are mostly related to reverse fault zones and have a trend approximately parallel to reverse faults and fracture surfaces. The mineralization is in the form of scattered grains, veins, empty space filling and patches. The main elements of the mineralization include lead, zinc, and sometimes copper, which are in the form of galena, sphalerite, pyrite, chalcopyrite, cerussite, calcite, and silica minerals. Resistivity and induced polarization data acquisition has been designed and carried out first using the rectangle arrangement in order to determine the anomalous zones, and then, using the dipole-dipole arrangement in order to explore the lateral and depth extents of these anomalies. The study area was divided into two parts, in which the total number of resistivity and induced polarization data measurements in the two areas were made in 3313 stations. Moreover, two-dimensional modeling of resistivity and induced polarization data was done using the smooth inversion method, and to better display the results, all two-dimensional cross sections were combined to demonstrate the results in three-dimensional form. Finally, a number of 45 points were suggested for exploration drilling in the two areas.

Introduction

Gonharan area is geographically located in northwest of Isfahan Province and is geologically situated within the Sanandaj-Sirjan zone and in the Malayer-Isfahan metallurgical belt that is one of the major lead and zinc mining axes of Iran. This belt has a northwest-southeast trend. In general, the lower Cretaceous carbonate rocks of this belt host a large number of lead and zinc deposits. Considering the importance of Gonharan area from the view point of exploration of metallic deposits and the ability of the geophysical resistivity and induced polarization methods in exploration studies related to such deposits, we modeled and interpreted the acquired geophysical data, and then, compared and combined the results of geophysical and geological studies for exploration of lead and zinc deposits in the area. Consequently, suitable places were recommended to carry out exploration drilling in the area.

Methodology and Approaches

The main exploration method, used in the area, is based on field prospecting operations, examination of rock units and sampling of dolomite limestone units, and investigation of surface and subsurface mineralization. For this purpose and to determine the genesis of the lead and zinc deposits in the area, 18 samples were collected from the area, and then, were studied. In this regard, thin sections from the samples were prepared and studied. Based on the preliminary geological studies and evidence of mineralization in the area, field operations for acquisition of resistivity and induced polarization data were conducted to identify the anomalous zones in the subsurface, and then, the data were modeled using two-dimensional smooth inversion method, and interpretation of the results of geophysical and geological studies in the area was carried out. Finally, based on the interpretation results, suitable places were suggested for exploration

drilling to indicate the possibility of lead and zinc mineralization in the area.

Results and Conclusions

Gonharan lead and zinc deposits have carbonate host rock of early Cretaceous massive limestone. The lead and zinc mineralization is seen in the form of stratification inside the massive limestone alteration zones. The texture of the mineralization is in the form of scattered, veined, and filling the empty spaces and spots. The mineralization is mainly associated with dolomitic-siliceous alteration. Geophysical operations using resistivity and induced polarization methods have been carried out along 29 survey lines in the area, and as result of modeling the results, geophysical cross-sections have been obtained. A total of 3313 resistivity and induced polarization data points has been measured along the survey lines in which the length of each line varies from 360 to 420 meters. As a result of the geophysical data interpretation and considering geological studies and objective observations, a number of 45 borehole locations has been proposed for exploration drilling.