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Geology, mineralization, mineral chemistry, and chemistry and source of ore-fluid of Irankuh Pb-Zn mining district, south of Isfahan

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Introduction

The Irankuh mining district area located at the southern part of the Malayer-Isfahan metallogenic belt, south of Isfahan, consists of several Zn-Pb deposits and occurrences such as Tappehsorkh, Rowmarmar 5, Kolahdarvazeh, Blind ore, and Gushfil deposits as well as Rowmarmar 1-4 and Gushfil 1 prospects. Based on geology, alteration, form and texture of mineralization, and paragenesis assemblages, Pb-Zn mineralization is Mississippi-type deposit (Rastad, 1981; Ghazban et al., 1994; Ghasemi, 1995; Reichert, 2007; Timoori-Asl (2010); Ayati et al., 2013; Hosseini-Dinani et al., 2015). Geology of the area consists of Jurassic siltstone and shale and different types of Cretaceous dolostone and limestone.

The aim of this research is new geological studies such as revision of old geologic map, study of different types of textures and mineral assemblages within carbonate and clastic host rocks, and chemistry of galena, sphalerite, and dolomite. Finally, we combined these results with isotopic and fluid inclusion data and discussed on ore-fluid conditions.

Materials and Methods

In order to achieve the aims of this work, at first field surveying and sampling were done. Then, 200 thin and 70 polished thin sections were prepared. Some of the samples were selected for microprobe analysis and galena and sphalerite minerals were analyzed by using JEOL- JAX-8230 analyzer at Colorado University, USA. The chemistry of dolomite and fluid inclusion data are used after Boveiri Konari and Rastad (2016) and stable isotope is used after Ghazban et al. (1994).

Discussion

The Irankuh mineralization is hosted by carbonate rocks (dolostone and limestone) and minor clastic rocks as epigenetic. Mineralization has occurred as breccia, veinlet, open space filling, spoted, dessiminated, and replacement (carbonate hosted rock). The mineral assemblages are Fe-rich sphalerite, galena, minor pyrite, Fe- and Mn-rich dolomite, bituminous, ankrite, calcite ± quartz ± barite within carbonate host rocks, whereas Fe-rich sphalerite, galena, pyrite, minor chalcopyrite, low Fe-dolomite, quartz, bituminous, ± barite ± calcite are important primary minerals at clastic host rocks.

There is positive correlation between Ag and Sb values within galena mineral. Sb/Bi ratio in galena is up to 20, which is an indicator of low temperature deposits (Malakhov, 1968). The Irankuh homogenization temperature (170 to 260 ºC) is higher than that of US Mississippi-type deposits (80 to 120 ºC). Based on comparison of T_h and Fe and Cd contents in sphalerite from Irankuh and US deposits (Viets et al., 1992), homogenization temperature of deposit has a

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positive relation with Fe values and a negative relation with Cd contents in sphalerite. Fe content in Irankuh sphalerite has reached up to 5% and Cd value is lower than 2000 ppm. In addition, carbonate hosted rock hydrothermal dolomites that are Fe-rich and ankrite have formed at some places. The evidence shows that Irankuh ore-fluid is Fe-rich. However, clastic hosted rock hydrothermal dolomites are low-Fe due to reaction of Fe and S resulting in pyrite formation. Based on O isotope (16–19 ‰) value from hydrothermal dolomites (Ghazban et al., 1994), ore-fluid has been derived from continental crust.

Results

Fe-rich sphalerite and dolomite and ankrite are the most important characteristics of Irankuh mining district. Temperature and Fe-rich nature of ore-fluid and mineralogy signatures of Irankuh area can be used for exploration of this type of mineralization in Iran and the world. The Irankuh mining district is MVT type mineralization.

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