Sulfur isotopic composition at Galali iron deposit Kordeastan state-Iran

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Abstract

The skarns were studied of the Galali Fe deposit. Kordestan province, Iran. In the Galali mine, Nos. 1 to 3 Fe ore bodies are arranged along a calcareous horizon from proximal to distal in this order to a syenitic intrusion. According to the distance from the Syenitic intrusion, mineral assemblages in skarns are systematically changed. Garnet isn't the most predominant skarn mineral throughout the deposit. Amphiboles, and plagioclase, however, predominate in the proximal skarns, instead calcite is common in the distal skarns. Chlorite is characteristically present only in the ore body. When garnet crystal shows zonal structure, isotropic andraditic garnet occupies the core, and is surrounded with anisotropic less-andraditic garnet. The presence of white skarn along the boundary between main skarns and host sedimentary rocks confirms relatively reducing environment prevailing as a whole in the studied area. However, the compositional relation between coexisting garnet and clinopyroxene demonstrates that relatively oxidizing condition was achieved for garnet skarn and Magnetite ore in the distal.

Sulfur isotope studied on pyrite, chalcopyrite and native sulfur. Sulfur is a volatile element that can be degassed during ascent of magma. Degassing causes sulfur isotope fractionation; the isotopic composition of sulfure in orebody can vary with the concentration. The sulfur isotope composition of the orebody is however, also dependent on its source and formation. Sulphur isotopic values consistent with an evaporitic origin.

Introduction

Galali orebody is located in Kordestan state western of Iran its coordination's are E47^0 54/093$^{/,}$ N 34^o 59/196$^/$ and average elevation is 1900 m, in the Karamkhani mountain. The Galali is one of some major iron orebodies in the Kordestan state (Fig, 1); the studied area is occupied by Jurassic strata, Formations from lower to upper, striking NW-SE and dipping NE. They are mainly composed of clastic sediments, like shale and limestone. Two Galali syenitic to granitic intrusives and some much smaller ones are exposed in the area (Fig. 1). They are highly differentiated and fine-grained intrusions.

Skarns and Skarn Minerals: In the studied area, metallic minerals are exclusively impregnated in skarns, and it is obvious that the study of skarns and skarn minerals is essential to obtain the information on genetical conditions of the deposits. Mainly based on the field observation, observation under the microscope, and electron probe microanalysis, It was clarified that skarn lenses of Galali iron deposit, consist of various Kinds of skarns, and that each skarn lens has a certain characteristic skarn mineral assemblage. The skarn consists mainly of plagioclase, clinopyroxene and Garnet. Chlorite is characteristically present only in the ore body.

This iron deposit is the largest known iron resource in the area. The main ore are magnetite but hematite, goethite, pyrite, secondary limonite, malachite and native sulfur are present. Three type of ore are found in Galali orebody:

1) type I: this ore is made from compact, high density and high grad magnetite. Fine grain, Subhedral to unhedral pyrite has found in this type as minor mineral. This phase is dispersed in magnetite.(Fig 2)

2) type II: silicates as chorolite, biotite and amphiboles. Oxides are magnetite and hematite and sulfide as pyrite are made the second type ore, native very fine to fine grain sulfur is present. This phase is injected in the first type ore(Fig, 3).

3) type III: the hydrothermal goethite is the third type of ore in the Galali orebody this ore is found rarely and injected in Type II ore(Fig, 4).

This orebody is located between norths and south Galali faults, fault movements and mineral depositions have made this orebody.

Skarn, epydotization, dolomitization and some argelic veins are alteration halos around the orebody.

Next fault movements have creaked the orebody and have made the breccias texture in the area in narrow zone.

Samples for this study were collected in 2005. Sulfur isotope ratios obtained for pyrite and native sulfur from Galali orebody both from type I and type II mineralization. Sulfur is a volatile element that can be degassed during ascent of magma. Degassing causes sulfur isotope fractionation; the isotopic composition of sulfure in orebody can vary with the concentration. The sulfur isotope composition of the orebody is however, also dependent on its source and formation.

$\delta^{34}S$ in samples from the Galali orebody vary between +3.69 and +6.77‰ for pyrite and native sulfur.

Sulphur isotopic values consistent with a evaporitic origin (Rollinson 1992, Nielsen 1979 , Simard et al 2006) , however, with highly positive $\delta^{34}S$ values being interpreted in terms of the involvement of seawater or evaporitic sulfur

References

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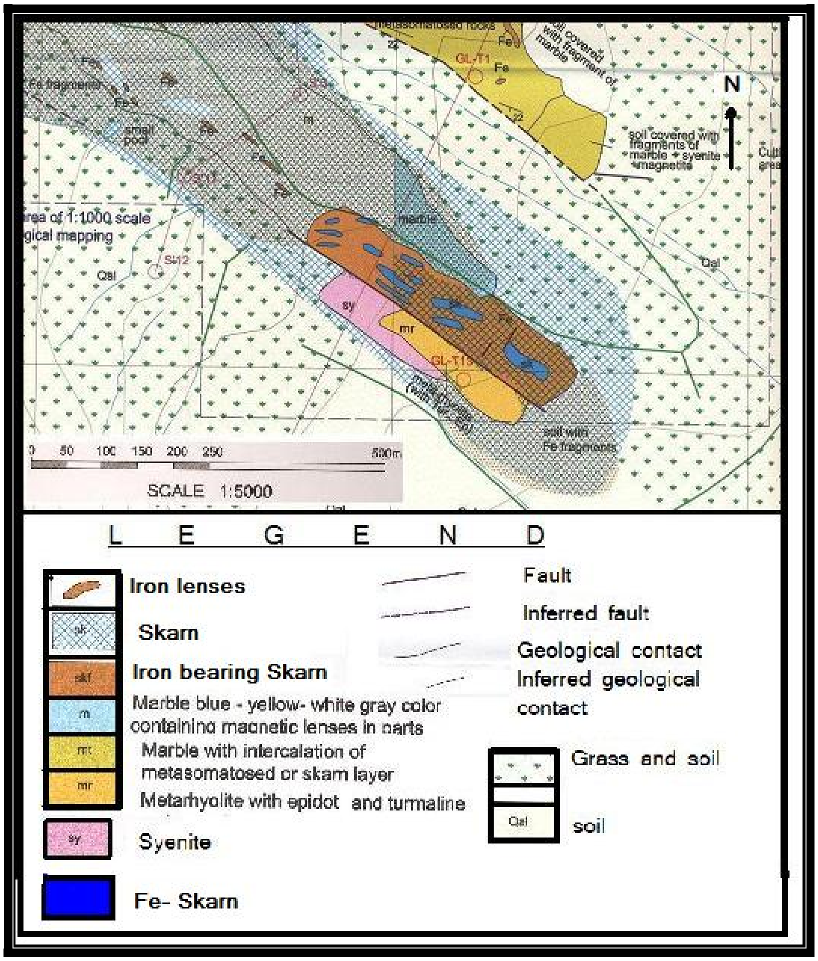

Fig.1 Geological map of the Galali mining area (After Ghorbani 1993)

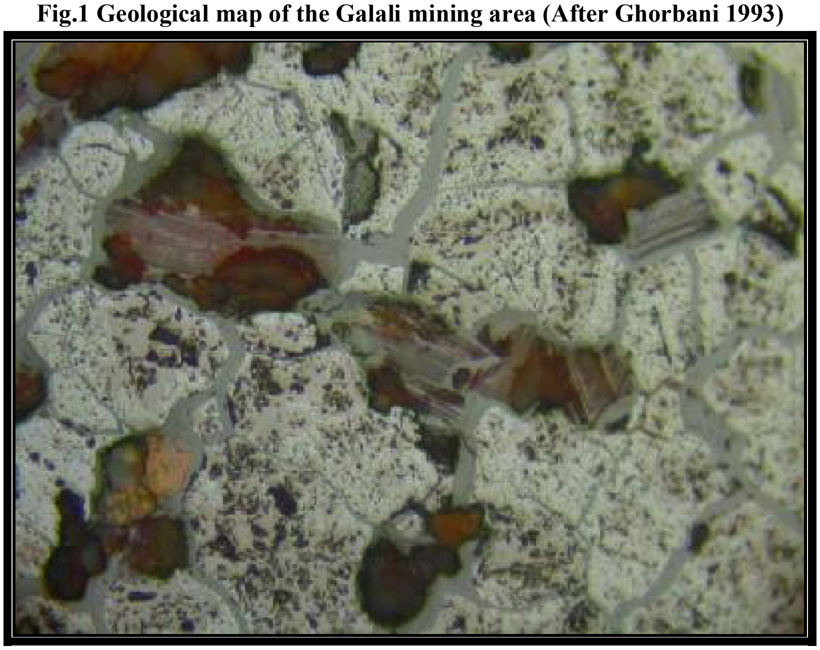

Fig.2: Microphotographs of some magnetite minerals(White to brown) in the Galai deposit Type I.

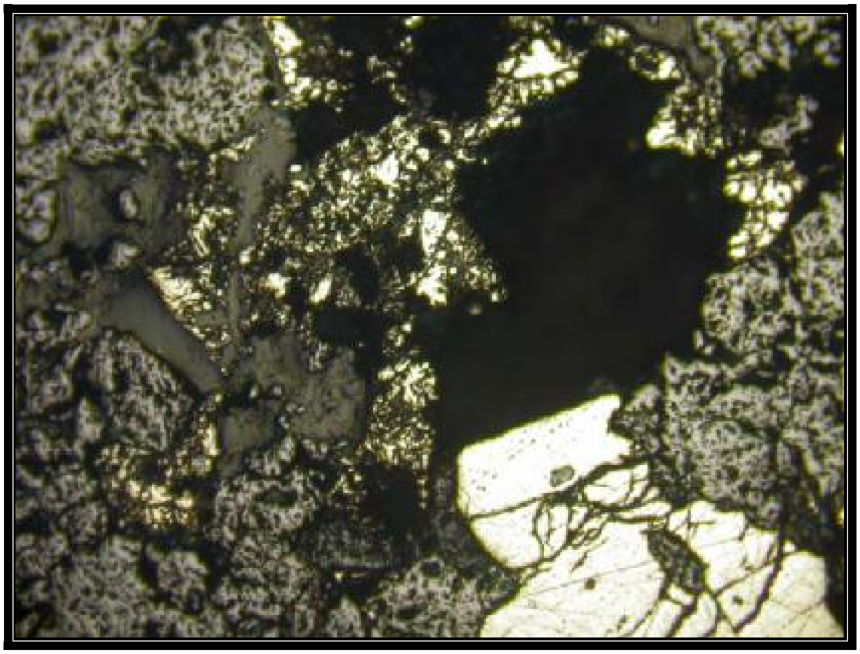

Fig.3: Microphotographs of some magnetite minerals (dark brown) and pyrite (wite to yellow) in the Galali deposit TypeI I.

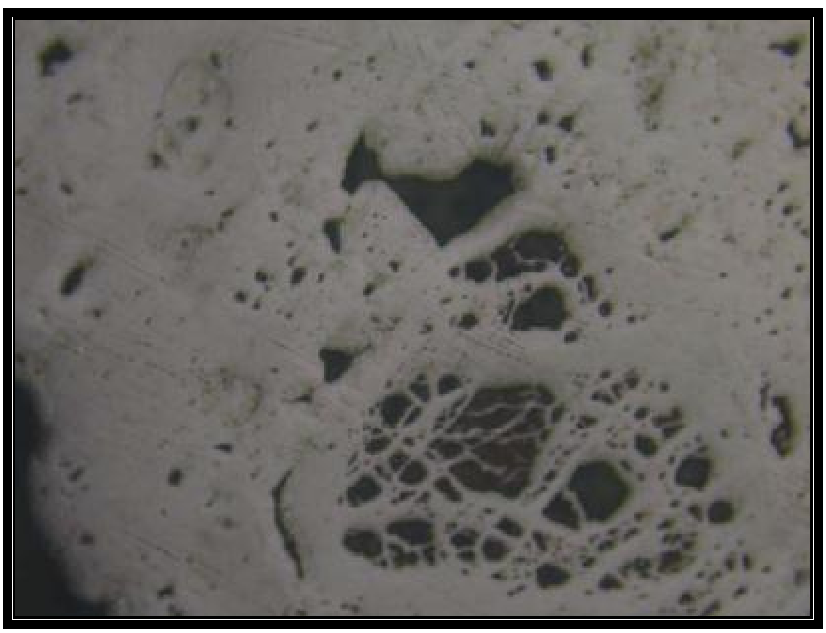

Fig4: Microphotographs of goethite with relict texture in the Galai deposit TypeIII.