



HAL
open science

Geochemistry of iron-oxide ore and country rocks from the Takab region, North Western Iran

Beate Orberger, Christiane Wagner, Colette Derré, Omar Boudouma, Michel Fialin, Maryam Hornamand, Ghassem Nabatian, Iman Mousef, Abdoullah Reza Ghods

► **To cite this version:**

Beate Orberger, Christiane Wagner, Colette Derré, Omar Boudouma, Michel Fialin, et al.. Geochemistry of iron-oxide ore and country rocks from the Takab region, North Western Iran. EGU General Assembly 2019, Apr 2019, Vienne (AUT), Austria. hal-02491097

HAL Id: hal-02491097

<https://hal.science/hal-02491097v1>

Submitted on 20 Apr 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Copyright



Geochemistry of iron-oxide ore and country rocks from the Takab region, North Western Iran

Beate Orberger (1), Christiane Wagner (2), Colette Derre (2), Omar Boudouma (2), Michel Fialin (2), Maryam Hornamand (4), Ghassem Nabatian (3), Iman Mousef (4), and Abdoullah Reza Ghods (4)

(1) Université Paris Sud Paris Saclay, Science de la Terre, Paris, France, beate.orberger@u-psud.fr, (2) Sorbonne Université, CNRS-INSU, Institut des Sciences de la Terre de Paris, ISTeP, UMR 7193, F-75005 Paris, France, (3) Zanjan University, Zanjan, Iran, (4) Institut of Advanced Studies of Basic Sciences Zanjan, Iran

Most of the iron ore deposits are located in the NE and central Iran, while the late Proterozoic iron ore deposits from the NW part (Takab region) are little known. They consist of (1) massive magnetite in metavolcanic rocks and (2) disseminated, layered and nodular ore types in calcschists.

1-The massive magnetite contains 55 wt.% Fe₂O₃, 22.5 wt.% FeO, 1.7 wt.% Al₂O₃, 30-88 ppm for Cu, Co, W, Zn and Zr; 15-25 ppm for V and Sr; <10 ppm for As and U. The epidotized and amphibolized metavolcanic host contains 54 wt.% SiO₂, 10 wt.% Al₂O₃, 3.2 wt.% Fe₂O₃, 6.6 wt.% FeO, 7.7 wt.% MgO, 8.8 wt.% CaO and 3.2 wt.% Na₂O. Traces are higher than in the ore, 70-270 ppm for Cr, Ni, V; 170-440 ppm for Sr and Ba. As and U are similar.

2-The disseminated, layered and nodular type iron ores occur in calcschists rich in chloritized biotite. The calcschists contain 20 wt.% SiO₂, 1.2 wt.% Al₂O₃, 0.4 wt.% Fe₂O₃, 0.4 wt.% FeO and high CaO (42 wt.%), CO₂ (31 wt.%) and Sr (160 ppm) related to calcite. As and U are < 0.5 ppm.

- The disseminated ore consists of euhedral slightly hematized magnetite in a quartz, minor K-feldspar and phengite matrix. The feldspar hosts P (U, Th)-bearing phases, zircon and barite. Fe₂O₃ (5-15 wt.%) and Al₂O₃ (0.2-14 wt.%) are inversely correlated. Traces are variable and higher than in the massive magnetite: Ba, 900-2450 ppm; Rb, V, Zr, W, 20-370 ppm; As, 31 ppm; U < 2 ppm.

- The layered ore consists of partially hematized magnetite surrounded by goethite, also present in veins. Magnetite grew around detrital zircon and hosts pyrite relics and droplet-like inclusions of PbS and ZnS. The quartz matrix hosts Mn-Ba-oxides, barite, and rare uraninite. Fe₂O₃ (12-55 wt.%), FeO (0.56-12 wt.%) and Al₂O₃ (0.8-0.33 wt.%) are variable. High Ba (15 wt.%) and S (4.6 wt.%) are related to barite. As, V, Zn (80-110 ppm) are higher than in other ore types.

- The nodular ore is composed of magnetite -not metasomatized- and quartz. Magnetite includes phosphates, Mn-Fe carbonates and uraninite. Magnetite contains high Fe₂O₃ (60 wt.%) and FeO (11 wt.%) and low Al₂O₃ (0.1 wt.%). Pb, Zn (1000 ppm) and Cd (60 ppm) are high, Ba low (<2000 ppm), As and V similar than the other ore types.

The massive magnetite shows no Eu anomaly and a positive Ce anomaly, while its metavolcanic host has a strong Eu positive anomaly. The three iron ore types from calcschist have similar REE patterns with positive Eu and negative or no Ce anomalies. The calcschist has a negative Ce anomaly. The Ba richest layered ore is poorest in LREE. These results confirm the previously proposed scenario based on petrology and $\delta^{56}\text{Fe}$ data (Orberger et al. 2017, 2018): A hydrothermal (volcano-) sedimentary environment includes the influx of Ba and S in some layered ores, while Pb and Zn are preferentially related to nodular ore.