Mineral chemistry of magnetite and fluid inclusions studies in the Kuh-Baba iron deposit, south of Hashtroud, NW Iran

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Abstract: The Kuh-Baba iron ore deposit is located about 70 km south of Hashtroud, East-Azarbaidjan Province, NW Iran. The deposit is genetically affiliated with intrusive bodies of gabbroic to dioritic composition. The principal host rocks for the Fe mineralization include units of gabbro-norite and pyroxene hornblende gabbro-norite. The widespread alteration zones which are accompanied with Fe-mineralization are actinolitization, chloritization and epidotization. The principal ore mineral is magnetite with subordinate apatite showing massive, vein/veinlet, replacement, brecciated, and disseminated textures. The results of electron probe micro-analysis (EPMA) on 28 points of magnetite crystals show relatively high amounts of elements such as Al, Mn, Ti, and V. The values of components such as TiO₂, V₂O₅, NiO and MgO in massive magnetites are higher than those present in disseminated and veinlet-type magnetites. Studies of primary fluid inclusions in quartz crystals coexisting with magnetite mineralization show that they are mainly liquid-rich 2-phase (L+V) and occasionally monophasic-vapor (V). The homogenization temperatures of liquid-rich 2-phase inclusions range from 436°C to 544°C (average of 505°C). Based on temperatures of the last melting point of ice (Tm), the obtained average salinity is 15.82 wt% NaCl eqv. Considering the measured parameters such as homogenization temperature, salinity, density, and pressure of the fluid inclusion, the depths of magnetite mineralization were estimated to be within the range of 1.3-2.7 (average of 2.3) km (based on the lithostatic pressure). According to the EPMA and fluid inclusion data, the Kuh-Baba iron ores deposit can be classified as a ‘Kiruna-type’ and subtype Iron-Oxide apatite-poor deposits and the origin of magnetite can be conceived as both magmatic and high-temperature hydrothermal.

Keywords: Mineral chemistry of magnetite; study of fluid inclusions; Kuh-Baba; Hashtroud; Iran.

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