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The Study of Major and Trace Elements Geochemistry of Gezeldash Daghi Mn Deposit, NW of Marand (Eastern Azerbaijan)

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Introduction

It is generally understood that manganese deposits have a diverse origin, based on their mineralogy, chemical composition and tectonic setting. Marine Mn-bearing deposits are classified as hydrogenous, hydrothermal and also biogenetic-bacterial deposits (Bonatti et al., 1972; Hein et al., 1997; Bau et al., 2014; Polgári et al., 2012; Schmidt et al., 2014). Hydrogenous processes can form ferromanganese crusts, which result from slow precipitation of seawater at the seafloor often via microbial mediation (Toth, 1980; Dymond et al., 1984; Bau and Dulski, 1999; Usui and Someya, 1997; Hein et al., 2000; Jach and Dudek, 2005). Diagenetic manganese deposits occur as nodules and precipitate from hydrothermal solutions or pore water (Polgári et al., 1991; Oksuz, 2011; Polgári et al., 2012), whereas hydrothermal ore deposits are stratabound or occur as irregular bodies and epithermal veins, where they are formed in a marine environment near spreading centers, intraplate seamounts or in subduction-related island arc setting (Roy, 1992; Roy, 1997; Hein et al., 2008; Edwards et al., 2011).

Materials and Method

Eighteen Ore samples (~ 500 g each) were collected systematically from the Gezeldash Daghi manganese deposit. All these ore samples were taken representatively from the surface outcrops ore beds in different places for geochemical analyses. Ore samples were powdered under 200 meshes and analyzed at Iran mineral processing research center laboratories, Tehran. After being prepared by the Lithium Borate Fusion method, their major oxide and trace element contents were determined with ICP-OES. The results of the analyses are given in Tables 1 and 2.

Results and Discussion

The deposit is hosted in various lithology and horizons consisting of: 1) tuffite interlayered with limestone, 2) conglomerate and sandstone lithology into volcano-sedimentary basin located at 25 km northwest of Marand city (N38°35′40″, E45°42′40″). Major and trace element assessments show that hydrothermal solutions were effective in the formation of the Gezeldash Daghi manganese deposit. Also, field observations reveal that manganese mineralization occurred as laminated-layered and fracture-filling form in limestone and tuffite at horizon I and the space-filling form between conglomerate clasts and veinlet form in sandstone at horizon II with quaternary age. Therefore, it can be concluded that hydrothermal solutions were caused in the formation of the manganese deposit which may be described as related to volcano-hydrothermal occurrence.

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