Stratigraphic, petrographic and facies characteristics of the Tash and Astaneh Bauxitic-Lateritic deposits in easthern Alborz: Paleoenvironmental implications

Shamanian, G.H.[1]*, Monfared, Z.[1], Omrani, H.[1]

1- Associate Professor, Geology Department, Faculty of Science, Golestan University, Gorgan, Iran
2- M.Sc. student in Economic Geology, Geology Department, Faculty of Science, Golestan University, Gorgan, Iran
3- Assistant Professor, Geology Department, Faculty of Science, Golestan University, Gorgan, Iran

*Email: gh.shamanian@gu.ac.ir

Introduction

Bauxite deposits can be classified into two main categories according to the bedrock lithology including karstic bauxites, overlying the carbonate rocks and lateritic bauxites overlying alumosilicate rocks (Bardossy, 1982). The Alborz structural zone in northern Iran is the host of a number of important karstic bauxite deposits. Tash and Astaneh bauxitic-lateritic deposits are two of them, located about 40 km north of Shahroud and 30 km northwest of Damghan, respectively. The Tash bauxite deposit has been developed as a stratiform horizon along the contact zone of Ruteh limestone and Elika dolomitic limestone, whereas the Astaneh laterite deposit located along the contact zone of Triassic dolomitic limestones and Jurassic shale and sandstones. In this paper, the Tash and Astaneh bauxite deposits are examined in terms of field relations, lithologic associations, petrography, mineralogy and geochemistry. The objectives were to determine the deposit characteristics, the paleoenvironmental conditions in the region and the processes responsible for the mobilization, fractionation and deposition of Al, Fe, and Si.

Materials and methods

28 samples were collected from the Tash and Astaneh deposits. Petrography of the samples was carried out by the conventional microscopic methods at the Golestan University. Mineralogical analyses were done by an X-ray diffractometer equipped with CuKα tube and monochrometer (XRD Philips PW 1800) at the Kansaran Binaloud Company. For whole-rock geochemical analyses, the samples were crushed to 200-mesh using an agate mill. All analyses were carried out at the Kansaran Binaloud Company using a wavelength X-ray fluorescence spectrometer (XRF Philips PW 1480).

Discussion

The Tash bauxite deposit has been developed as a stratiform horizon with more than 3 km long and about 10 m thick along the contact zone of Ruteh limestone and Elika dolomitic limestone. This deposit shows excellent relations between the bauxite and the footwall and hanging-wall limestones. The base of the bauxite horizon is undulatory, whereas the top contact is concordant with the overlying limestones. The Astaneh laterite deposit is 4 km long and about 15 m thick. The basal contact zone of the laterite horizon is mainly undulatory, whereas the upper contact zone is concordant with the hanging-wall shales and sandstones.

Textural analyses indicate that both allochthonous and autochtonous origins for both deposits. For example pseudo-breccia, colloform, and pisolitic textures reveal an authigenic development during the bauxitization processes. In contrast, reworked bauxite fragments, broken oolites and pisolites of various shapes and sizes indicate reworking or clastic accumulation (Ozturk *et al*., 2002).

Based on mineralogical and textural features, the Tash and Astaneh deposits can be divided into five and three distinct units, respectively. The Tash deposit is mainly composed of diaspore, anatase, kaolinite, hematite, goethite and berthierine, whereas the quartz, hematite, goethite kaolinite and anatas are the most abundant minerals in Astaneh region.

The Tash and Astaneh deposits have a complex history of deposition, uplift, subaerial erosion and karst weathering. The mineral assemblages, textural and facies evidences, wall-rock relationships and geological settings show that Tash and Astaneh deposits formed during three and two main stages, respectively. First, bauxite and laterite materials and clay minerals were developed as authigenic bauxitization and lateritization processes of the parent rock. During the second stage, these materials were transported to karst depressions,

where they accumulated as a relatively thick bauxite horizon in Tash and lateritic lenses in Astaneh. Finally, during the third stage which has occurred only in the Tash deposit, the ore upgraded to 52% alumina by in situ leaching and desilicification.

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Keywords: Bauxite; laterite; textural analyses; facies evidence; Tash; Astaneh.

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