

IDENTIFICATION OF STRUCTURAL FACTORS FOR EXPLORING OF STRATIFORM COPPER DEPOSITS USING ETM⁺ DATA IN THE NORTH OF TABRIZ, NW IRAN

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Abstract

The study area is located in part of Arasbaran- Sabalan zone in the northwestern part of Iran. North of Tabriz recently became an interesting area with several stratiform copper occurrences (e.g., Anna Khatoon and Nahand deposits). Anna Khatoon and Nahand stratiform Cu mineralization area are, to date, observed in sandstone rock units belonging to the Ghom Redbeds Formation of Miocene age. These sediments overlie limestone's of Cretaceous age, and are covered with red and yellow marls interbedded with conglomerate and sandstone units of Pliocene age. The Ghom Redbeds Formation include alternations of red oxidized (iron oxide minerals) sandstones and conglomerates that partly convert to light grey colored varieties. It seems that creating conditions for a reducing sedimentary basin was the most important factor in the process of mineralization in this area. In addition, this unit has considerable deposits of evaporites, such as gypsum and salt. Also Miocene salt domes and Trachyandesite volcanic dome are related to this unit. The main ore minerals in the deposit are copper carbonates such as malachite, azurite and some copper sulfides such as chalcocite. This sedimentary sequences has suffered severe folding that developed the outcrops of continuous anticlines and synclines with trend NW-SE. In addition it has been observed that copper mineralization is controlled by deformation structures and ore bodies are commonly seen on the gently inclined limbs of the syncline. A combined remote sensing techniques and field studies was performed as a powerful tool to distinguish and map the relationships between rock units, structures and mineralization associated with stratiform copper deposits along the study area. The main image analysis techniques involved in this study were principal component analysis (PCA) and false color composite (FCC) with implication of fusion techniques. Comparison between Anna Khatoon and Nahand deposits indicate that the stratiform Cu mineralization in two deposits is controlled by similar sedimentary factors. In Anna Khatoon area the highest copper grades at surface outcrops and trenches were found along and near to NW-SE faults. At Nahand, where such faults are 2 to 3 km away, the Cu grades are much lower than at Anna Khatoon. This paper reviews performance characteristics of ETM⁺ data and applications of the new developed image processing methods applied to the data as a tool for mapping structural feature zones and alteration associated with Sediment- hosted copper deposits and related host-rock lithology in the arid and semi-arid regions.

Keyword: Remote Sensing, stratiform, Cu mineralization, Tabriz, Iran.