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Useing of satellite image for exploration of Haji-Gak iron mine in Bamiyan, Afghanistan

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Abstract— The Haji-Gak mine is the largest iron ore mine in Afghanistan. Located in the center of Afghanistan, which has the gyological life of Paliozavi and pirm .he rocks of mytasomatic-hydrothermal-sedimentary origin. types of iron minerals, including magnetite, hematite, magnasite, and amphibolite and qaurtz. The combination of remote sensing and Field operations data is a powerful tool for mapping and interpreting iron mineralization in some area with intensely rugged topography or a broad expanse area, where systematic sampling and conventional geological mapping has some limitation and time consuming. The ground data and Space borne Therē-mal Emission and Reflection Radiometer (ASTER) satellite data groun data magnetometer data were used for evaluating and map- ping different types of iron mineralization in the Hajigak mining region. Preprocessing of the datasets involved band ratio (BR), principal component analysis (PCA). spectral angle mapper (SAM) constrained energy minimization (CEM) and land surface temperature(LST) of the visible-near infrared and short wave infrared Tir ASTER data were used to map four types of iron minerals (magnetite, hematite, magnasite, and amphibolite and qaurtz). For preparing a lith- ological map of this region, an RGB image produced by combination of BR and PCA R:(5+7)/6 G: PC3, B: PC5) LST Products Implementing SAM and CEM technique were useful for mapping and detecting magnetite, Hematite, Magnesite.

Index Terms— Haji-Gak Mining Region، Aster Sateillte، Field Operations،Geological، Spectral angle mapper،

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1 .Introduction

Geologists have been using remote sensing for discriminating and mapping rocks and minerals for a long time (Azaden Malek Shafaroudi el at 2017). The absorption features found in iron minerals are primarily due to two electronic processes, namely charge transfer and crystal field effect. In charge transfer, electrons move from ion to ion or ligand to ligand. Absorption features caused by charge transfers are diagnostic of the mineralogy of these iron oxides and hydroxides. The strengths of their charge transfer fea- tures are typically hundreds to thousands of times stronger and these features are recorded in the ultraviolet and visible electromagnetic domains (sharp fall in reflectance from 0.5 µm causing red color in iron oxide), while crystal field features are recorded in the near-infrared spectral domain(around.0.9µm).
(https://pubs.er.usgs.gov/publication/ds1035).

The reflectance spectra of iron-bearing samples containing hematite and goethite are characterized with a reflectance minimum or an absorption fea- ture near 0.9 µm. The iron absorption features at 0.9 µm are significantly reduced in terms of absorption depth when the grain size of a mineral is reduced. A large surface area to volume ratio of small grain-sized iron minerals results in a greater proportion of grain boundaries where crystal field effects are different from each other. This reduces the absorption strength of spectral features. Iron oxides and iron hydroxides are spectrally conspicuous and wider in terms of wavelength range of the absorption feature and these features are often used the key for delineating these minerals in spatia domain using superior.multispectral data(https://doi.org/10.3133/ds231).

Alteration minerals, (ASTER) AVIRIS, and Hyperion have widely been used for geological exploration (Crosta et al. 200۸ Rowan and Mars 200۷ The ASTER multispectral data have been used in mineralogical and lithological studies (Abbas Teemed et al 2020). and mineral resources. Multi and Key