

DISCOVERY OF GOLD MINERALIZATION AND ASSOCIATED HYDROTHERMAL ALTERATION IN WADI ONIB AREA, RED SEA STATE, SUDAN THROUGH EARTH OBSERVATION DATA

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Abstract

A new gold occurrence has been discovered in Wadi Onib area in the north-eastern part of the Red Sea State of Sudan, using Digital Image Processing (DIP) of earth observation data. The study area being arid and highly rugged as rest of the African-Arabian deserts, offers a congenial terrain for mineral exploration, especially gold using remote sensing.

Band Math/Band Ratioing algorithms were adopted in this study to highlight the haloes that have resulted due to hydrothermal alteration exhibiting oxidized zones on the surface. The ratios viz., Band 2/Band 1 and (Band 4 +Band 6)/Band 5 of ASTER satellite data employed in the current study has revealed conspicuous WNW-ESE elongated spectral features along a fracture of the same trend. Ground validation of this spectral feature has confirmed the presence of highly altered andesites and phyllites which form wall rocks of the mineralized smoky and milky quartz veins.

Fire assay of the rock chip samples drawn from these altered outcrops over a 600m X 50m area has revealed 0.1 to 4.5 ppm Au. Petrographic study has confirmed the presence of chlorite, carbonate, ferruginous clayey material, sericite and biotite as being the minerals associated with the process of hydrothermal alteration. Gold, sphalerite, covellite, chalcopyrite and pyrite were present as the ore minerals. X-Ray Diffraction studies have confirmed the presence of alteration minerals viz., illite, hematite and goethite. Presence of illite, and other alteration minerals as confirmed by petro-mineralogical and XRD studies point towards propylitic facies of hydrothermal alteration. The prime objective of this paper is aimed at highlighting the successful application of remote sensing techniques resulting in the discovery of gold mineralization associated with hydrothermal alteration in the study area. Laboratory studies have further substantiated the results obtained through remote sensing techniques and ground validation. Based on considerable dimension of these hydrothermally altered outcrops exhibiting significant gold values, this occurrence is recommended for sub-surface exploration to assess its economic viability.

Keywords: Remote Sensing, Earth observation data, ASTER, Digital Image Processing, Band Ratioing, Hydrothermal alteration, Propylitic facies, gold mineralization, XRD, Wadi Onib, Red Sea State, Sudan