

# **Application of Imaging Spectroscopy in Mineral Exploration and Lithological Discrimination: An Investigation from Mamandur Polymetal Prospect, Tamil Nadu, India**

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Mamandur Pb-Zn-Cu sulphide prospect is a part of southern Indian granulite terrain comprising of high grade metamorphic rocks. This work illustrates how field and satellite reflectance and emission spectroscopy of ore bodies, alteration zones and host rocks can be effectively utilized for rapid mineral potential estimation and lithological mapping in high- grade terrains. The methodology involves (i) delineation of mineralized areas using ASTER and Hyperion satellite images followed by (ii) field verification and generation of reflectance, emission spectra of outcrops, and (iii) collection of representative samples for conventional exploration strategies like petrography, geochemistry, and mineralogy. Petrography indicate pyrite, chalcopyrite, galena, sphalerite as the main sulfide minerals in a host rocks of mafic granulites containing about 55-60% of Fe-Mg minerals and 35-40% of felsic minerals, charnockite having quartz (25-30%), plagioclase (8-10%), K-feldspar (5-8%), orthopyroxene (15-20%) and cordierite (25-30%). These results are observed to commensurate well with field spectroscopy, geochemical analysis and hyperion image analysis. The lithological boundaries, hydro thermal alteration zones and boundaries of Pb-Cu-Zn mineralized areas discerned using ASTER and Hyperion data by Spectral Angle Mapper (SAM) and band ratio techniques are highly effective. By spectral unmixing, abundances of ore-, and alteration- minerals were estimated which are observed to be in concurrence with the laboratory based estimates. Therefore, the study suggests that imaging spectroscopy is an efficient tool in finding out the regions of interest (ore mineralization and alteration) and also the constituent minerals and efficiency to resolve image spectra into constituent minerals and its abundances is remarkable.