

ESTABLISHING A MINERAL SPECTRAL LIBRARY FOR HYPERSPETRAL IMAGING OF ORE IN UNDERGROUND MINES - A CASE STUDY OF REICHE ZECHE, GERMANY

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Hyperspectral imaging has become an essential tool in mineral exploration and mining operations over the past three decades, with applications ranging from large-scale airborne surveys to close-range ground-based studies, particularly in surface mining, due to favourable environmental conditions. However, its application in underground mining remains limited, primarily due to technical and environmental challenges. This study addresses this gap by developing a hyperspectral library for the Reiche Zeche underground mine in Freiberg, Germany, aiming to enhance hyperspectral techniques in underground settings. Following standard hyperspectral analysis procedures, samples were collected from the mine, and hyperspectral data were acquired using SWIR and VNIR HySpex cameras. Data processing, including radiometric calibration with HySpex Ground software and ENVI software analysis, revealed distinct spectral profiles delineating geological zones such as the Upper and Lower Contact Zones, Contact Zone, and Orebody. These findings demonstrate the potential of hyperspectral imaging to differentiate various ore types and geological features within an underground environment. While additional data and mineralogical analysis are necessary to support the validity of the results, this study sets a foundation for future research and encourages the broader implementation of hyperspectral techniques in underground mining operations.