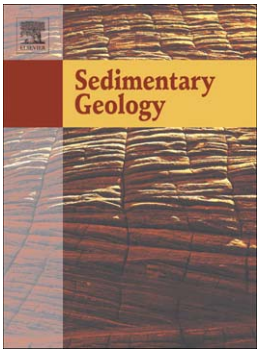

Mapping of diagenetic processes in sandstones using imaging spectroscopy: A case study of the Utrillas Formation, Burgos, Spain

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MAPPING OF DIAGENETIC PROCESSES IN SANDSTONES USING IMAGING SPECTROSCOPY: A CASE STUDY OF THE UTRILLAS FORMATION, BURGOS, SPAIN

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ABSTRACT

Imaging spectroscopy is applied to sandstone formation to study diagenetic processes in sedimentary deposits. The study was carried out on the upper member of the Utrillas Formation in Spain. Shortwave infrared and visible near-infrared Specim® hyperspectral cameras were used to scan near-vertical and well-exposed outcrop walls. Reflectance spectra from close-range hyperspectral imaging was compared with high-resolution laboratory spectra, hyperspectral imagining data, thin sections, and results of previous sedimentological studies to analyze geochemical variations and quantify facies and diagenetic mineral abundances.

Distinctive characteristics of the absorption features of clay minerals were used to develop a kaolinite crystallinity index to identify detrital kaolinite and authigenic kaolinite in the Utrillas Formation. Results show that poorly ordered kaolinite is only present in floodplain deposits, whereas well-ordered authigenic kaolinite is related to paleochannel deposits and organic-rich irregular patches. Meteoric water flux probably induced feldspar and mica alteration, as well as authigenic clays precipitation. Contemporary microbial degradation of organic matter in the subsurface might be the cause of authigenic clay formation at the alteration areas. This study provides new data and interpretation on diagenetic alterations of the Utrillas Formation. Results of this work may have important implications in the mining industry as a methodology to evaluate mining areas of interest.

Keywords: Ground-based hyperspectral imaging; mineral mapping; Utrillas Formation; clay minerals