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Core-Based Chemostratigraphy of Texas Organic-Rich Mudrocks by Hand-Held Energy-Dispersive XRF

Harry Rowe and Niki Hughes
Earth and Environmental Sciences, University of Texas at Arlington, Arlington, TX, USA (hrowe@uta.edu)

Chemostratigraphy, the identification of shifts in geochemistry within a section of strata, can be used as a correlation tool or to help make inferences about the paleo-depositional environment of a unit or group of units. Traditionally, methods such as wavelength-dispersive x-ray fluorescence (WD-XRF), or inductively-coupled plasma mass spectrometry (ICP-MS), or more recently, stationary, high-end energy-dispersive x-ray fluorescence (ED-XRF) have been used to obtain geochemical data; however, a more efficient means of data collection using portable ED-XRF equipment allows the investigator to take rapid, non-destructive direct measurements.
While undertaking ED-XRF analysis of mudstones, it has been determined that calibrated results from the hand-held ED-XRF effectively define chemostratigraphic changes in real time. When compared with WD-XRF systems, the much lower cost and enhanced portability of the hand-held ED-XRF systems provide an exceptional tool for linking down-core geochemical changes to stratigraphic, sedimentological, and paleontological observations. Furthermore, with a working calibration, quantitative results can be used to assess the dominant mineral phases within an interval.
Results from several cores are evaluated in the study, including: the Devonian-Mississippian Woodford and Barnett Formations; Pennsylvanian Smithwick Formation; and Cretaceous Eagle Ford Formation. Pressed pellet standards from the Smithwick, Barnett, Woodford, and Eagle Ford, along with various international standards were used to create a matrix-specific calibration for organic-rich and organic-poor mudstones. The calibration is used to quantify major and trace elements for all cores.