Application of Energy-Dispersive X-Ray Fluorescence (ED-XRF) in Chemostratigraphy of Organic-Rich Mudstones of Texas

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Chemostratigraphy involves the identification of shifts in geochemistry within a section of strata, which can be used as a correlation tool or to help make inferences about the paleodepositional environment of a unit. Traditionally methods such as wavelength-dispersive x-ray fluorescence (WD-XRF) or inductively coupled plasma mass spectrometry (ICP-MS) have been used to obtain geochemical data; however, energy-dispersive x-ray fluorescence (EDXRF) provides a more efficient means of data collection by using portable equipment that allows the investigator to take non-destructive direct measurements.

While undertaking ED-XRF analysis of mudstones, it has been determined that calibrated results from the handheld ED-XRF effectively define chemostratigraphic changes in real time. When compared with WD-XRF systems, the much lower cost and enhanced portability of the typical 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 four cores are evaluated in the study: Devonian- Mississippian Woodford Shale, Pecos Co., TX; Mississippian Barnett Formation, Wise Co., TX; Pennsylvanian Smithwick Formation, San Saba Co., TX; Cretaceous Eagle Ford Shale, Bee Co., TX. Pressed pellet standards from the Smithwick and Barnett along with various international standards were used to create a matrix-specific calibration for organic-rich mudstones. The calibration is used to quantify major and trace elements for all cores.