The role of X-ray fluorescence in source rock analysis

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X-ray fluorescence (XRF) is a non-destructive method that can be used to determine elemental concentrations of well-bore samples. This study examines how an XRF machine works, what geochemical characteristics can be calculated, and why this analysis is useful in the determination of source rock intervals. An XRF machine completes an analysis by bombarding a core or cutting sample with a spectrum of X-rays. These high energy electromagnetic waves eject electrons from the inner shell (K and L) of the atoms that make up the sample. The ejected electrons produce vacancies in the K and L shells that outer shell (M and N) electrons fill. The transition of electrons from an outer shell to an inner shell emits fluorescent, characteristic X-rays. The concentrations of key elements: Si, Fe, K, Al, Ca, Mo, and U are used to determine relevant geochemical ratios. These ratios define characteristics of sample lithology, lateral continuity, and depositional environment. By defining these attributes, a better understanding of the hydrocarbon generation potential and a more accurate description of source rock intervals is developed. The use of XRF analysis to supplement additional well-log data leads to a thorough and complete analysis of well-bore samples.

Atlantic Geology, 2014, Volume 50, Number 1
Atlantic Universities Geoscience Conference 2014: 64th Annual Conference - Abstracts
doi: 10.4138/atlgeol.2014016