

Quantitative grain size analysis of the silt fraction in mudrocks

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Very little is currently known about the key compositional components of mudrocks despite their growing value as a reservoir for hydrocarbon resources. As technology and imaging techniques have advanced over the years it is now possible to quantitatively assess various mudrock properties at the micron scale. It is our goal to gather data from mudrocks across three different formations of varying ages, compositions and thermal maturity in order to determine some of the important controls on these valuable source rocks.

Our current and future efforts are focused primarily on the Cretaceous Pearsall Formation of the Maverick Basin, the Permian Barnett Formation of the Fort Worth Basin, and the Devonian Marcellus Formation of the Appalachian Basin. We compiled images of these mudrocks using backscatter and secondary electron images and energy dispersive spectroscopy (EDS) elemental x-ray maps on a scanning electron microscope (SEM). Using these images we interpreted the mineralogy of the silt size grains (2-63 μm). After tracing each grain in each of the SEM images using *Jmicrovision*, we were able to collect very precise measurements for detailed analysis. These analyses included size, shape, composition and orientation of each grain within the rock, and allowed for comparison across the suite of samples.

Grain size comparisons were completed using traditional cumulative frequency diagrams (in units of phi) and as cumulative number vs diameter. We were also able to examine correlations (or lack thereof) between grain characterizations and composition. The two dominant mineral components are carbonates and siliciclastics, and while their relative abundance varies widely across samples within the same formation, grain size distributions exhibit many variations that are independent of this major compositional variation. So if the grain size distributions are not controlled by composition, it is our goal to demonstrate that they must be controlled by textural variations.

Keywords: mudrocks, Pearsall, Barnett, Marcellus, SEM, Jmicrovision