UTILIZATION OF CHEMOSTRATIGRAPHIC PROXIES FOR GENERATING SEQUENCE STRATIGRAPHIC FRAMEWORKS IN MUDROCKS AND SHALES

Bryan Turner
Geology, University of Oklahoma, Norman, Oklahoma
bwturner@ou.edu

Chemostratigraphy can facilitate the application of sequence stratigraphic correlations to mudrocks, and refine existing sequence stratigraphic frameworks, through elemental proxies. These proxies can highlight geochemical facies shifts that are not detectable through lithostratigraphic analysis alone. The principal elemental proxies used for this study are titanium (Ti), zirconium (Zr), aluminum (Al), potassium (K), calcium (Ca), strontium (Sr), molybdenum (Mo), vanadium (V), and the ratio between silicon (Si) and Al.

Relative shifts in these proxies can be used to interpret changing position in shoreline, highlight zones that are comparatively brittle and ductile, and provide an estimate for bottom water anoxia. These interpretations are fundamental for correlation within mudrock-dominated depositional systems as well as the identification of horizons that are likely to accumulate organic material and can be efficiently fractured during production of an unconventional resource play.

Measurements from core containing Woodford Shale intervals have been obtained and outcrop locations sampled from the Anadarko Basin, the Southern Cherokee Platform, the Arkoma Basin, and the Ardmore Basin near the Arbuckle Uplift. Additionally, the cores and outcrops were both scanned to obtain gamma ray profiles that can be used to tie these chemostratigraphic proxies to existing subsurface stratigraphic frameworks.

Chemostratigraphic frameworks resolve higher frequency cyclicity than is interpreted from conventional logs. It is possible to break out a minimum of seven regional transgressions and regressions within the Woodford Shale using chemostratigraphy. These data also suggest that the Lower Woodford experienced the highest degree of anoxia, but these conditions were localized and likely influenced by topography.

AAPG Search and Discovery Article #90249 2015 Grants-in-Aid Projects