

Fayetteville Shale exposures along the Ozark Uplift of north-central Arkansas - Stratigraphy, Geochemistry, and Petrography

Douglas W. Jordan¹, Craig Cormany², M. Ed Ratchford³, Douglas J. Schultz⁴, and Erin Smart⁴

1 Chesapeake Energy Corporation, Oklahoma City, OK 73118, doug.jordan@chk.com

2 EOG Resources, Oklahoma City, OK 73112,

Craig_Cormany@ eogresources.com

3 Arkansas Geological Survey, Little Rock, AR 72204,

ed.ratchford@ arkansas.gov

4 Weatherford Laboratories, Houston, TX 77086,

Douglas.Schultz@ weatherfordlabs.com; Erin.Smart@ weatherfordlabs.com

The Mississippian Fayetteville Shale crops out across north-central Arkansas along the edge of the Arkoma Basin. Nine outcrops of the Fayetteville Shale were studied for their sedimentology, sequence stratigraphy, and GR log character (using a hand-held scintillometer), and samples were obtained for petrographic (thin section/SEM) and geochemical (thermal maturation/ organic content) attributes.

The basal Fayetteville Shale overlies a ravinement surface present on top of the fossiliferous, quartzose, and very fine-grained Batesville Sandstone. Overlying the ravinement surface are interbedded organic-rich, silty to argillaceous and siliceous (locally phosphatic), petroliferous mudstones (transgressive deposits/ condensed interval) that contain local concretions (calcareous and iron-rich). The section changes to primarily siliceous mudstones and chert approximately 40 miles to the east. Upsection, in the vicinity of Marshall, Arkansas, numerous stacked, graded beds (storm events), consisting of ooid/bivalve packstones/wackestones changing to micritic mudstones, calcareous cherts, and siliceous mudstones (distal highstand?) occur. This sequence is cut by a ravinement surface having a bivalve-rich lag, and is overlain by dark-gray, siliceous mudstones that contain a strong petroliferous odor (transgressive deposits/condensed interval). The remainder of the outcrop consists of light-gray, micritic and siliceous mudstones in bed-thickening parasequences (highstand) that are sharply overlain (sequence boundary) by the oolitic Pitkin Limestone.

TOC values range from 0.28-8.3% (average 4.5%) and are generally higher in the organic-rich, siliceous and calcareous mudstones of the transgressive deposits/condensed interval associated with high GR values (over 200 API units). Vitrinite reflectance values (Ro) range from 0.82-1.55% (average 1.01%) and vary systematically with depth on the outcrop.