[Mechanisms for anomalous organic matter concentrations within the Roseneath-Epsilon-Murteree section of the Cooper Basin]

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MECHANISMS FOR ANOMALOUS ORGANIC MATTER CONCENTRATIONS WITHIN THE ROSENEATH-EPSILON-MURTEREE SECTION OF THE COOPER BASIN

ABSTRACT

2- 8% organic carbon enrichment within the Permian Roseneath-Epsilon-Murteree (REM) interval, deposited in a post glacial, cold climate system, goes against many well established paradigms for viable source rock deposition. Understanding the source of organic matter and the timing of diagenesis within this system may shed light onto the viability of this and other cold climate depositional systems as hydrocarbon source rock domains. The dominant lithology of the REM, based on core observations, backscattered electron microscopy (BSEM) and X-ray Diffraction (XRD), indicates a compositionally immature greywacke containing ~40% quartz, ~20% mica, and ~40% diagenetic products (kaolinite, illite, siderite and minor chlorite). BSEM highlights 2 dominant organic matter forms: 20-50µm particles with defined tabular and spherical shapes, and intergranular pore residing organics with grain coating features. RockEval indicates low S2 values varying between 0.1 and 3.0mgHC/gTOC indicative of low generative potential. Diagenetic kaolinite, illite, chlorite and Fe rich and Mg rich phases of siderite occlude the bulk of intergranular porosity. Variations in siderite abundance track coarser siltstone laminations on the 1-5mm scale, occurring as bands visible at the micron and core scale. Replacement of detrital mica and diagentic illite by siderite is observed in BSEM, while stable phases of kaolinite are observed in both Vintage Crop 1 (minimum %Ro=0.76) and Encounter 1 (minimum %Ro=3.6). The dominance of detrital plant material, the presence of pore-filling, grain coating organics, and the low generative potential of REM organics implies a migration driven hydrocarbon system. The key to prospectivity in the REM may therefore be linked to the timing of diagenetic pore filling seals relative to charge migration as opposed to in situ hydrocarbon generation.

KEYWORDS

Organic matter preservation, Cooper Basin, carbonate diagenesis, clay diagenesis, Backscattered Electron Microscopy, TOC, RockEval, EGME,

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