Introduction to the Micropetrography of the Upper Cretaceous Austin Chalk From the Texas-Mexico Border to Central Louisiana

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Abstract

The Austin Chalk is an active exploration trend in the onshore Gulf of Mexico. To understand the fundamental-scale properties of this unit, a core-based investigation at the nano- to millimeter-scale by was completed by integrating scanning electron microscopy and Rock Eval analyses. The study provides insight into the evolution of the Austin Chalk from deposition through burial diagenesis relative to changes in brittleness, pore networks, and organic matter. Grain-size texture ranges from clay- to silt-sized. The finer matrix is predominantly coccolith hash and lesser clay minerals. Clay minerals range from 10 to 70%. Planktic foraminifera and inoceramid fragments are the coarser components. The two fabric end members are homogeneous and laminated. The homogeneous samples have been highly bioturbated. Well-laminated samples lack burrows, while the poorly laminated lithofacies have some horizontal burrows. Calcite and illite are the main minerals that compose the Austin Chalk with much lesser quartz, feldspar, phosphate, and glauconite. Organic material occurs as Type III kerogen, Type II microbial mat kerogen, and migrated solid bitumen. The woody kerogen is generally several microns long and contains no OM pores. Microbial mats are thin irregular layers of organic material containing tangentially orientated clay flakes. Solid bitumen occurs in interparticle pores between coccolith hash and within tests of foraminifera. Three types of pores are observed within the Austin Chalk: (1) interparticle pores, (2) intraparticle pores, and (3) organic matter pores. Pores are generally in

the nanometer range. Primary interparticle nanopores between coccolith fragments dominate the pore network. In the thermally matures samples, organic matter pores are present within solid bitumen. The OM pores include spongy and bubble pores. The diagenetic history of the Austin Chalk is relatively simple. The most common diagenetic feature is mechanical compaction of both clay minerals and coccolith hash. This process destroyed an abundant amount of interparticle pore volume. Some chemical compaction also occurred. Pyrite in the form of framboids and euhedral crystals is present. Planktic foraminifera body cavities are cemented with calcite, pyrite framboids, kaolinite, or solid bitumen indicating some of the intraparticle pores remained open until the generation of bitumen. This study indicates that micropetrography leads to fundamental understanding of Austin Chalk reservoirs.