Diagenetic History of the Turbiditic Litharenites of the Chicontepec Formation, Northern Veracruz: Controls on the Secondary Porosity for Hydrocarbon Emplacement

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ABSTRACT

The litharenites of the Paleocene-Eocene Chicontepec Formation in the Camaitlán-Amatitlán-Horcones and surrounding oilfields record a complex diagenetic history. Grain-to-grain contacts suggest moderate compaction, and core examination reveals both fractures and thermal influence associated with diabasic igneous activity. Major diagenetic events include: 1) compaction, 2) first quartz overgrowth, 3) pervasive calcite and dolomite cementation, 4) fracture development, 5) partial dissolution of feldspars and calcite cement, 6) second quartz overgrowth, 7) authigenic clay cementation, and 8) hydrocarbon emplacement.

The detrital composition, facies distribution, and fractures were the main diagenetic controls on the secondary porosity evolution. Coarse-grained litharenites (calclithites) deposited in middle proximal areas of submarine fans are intensively cemented by calcite and dolomite (porosity less than 5%). The source of calcium carbonate intensive precipitation is attributed to dissolution of the abundant limestone grains in the sandstones' framework. In contrast, fine-grained litharenites and feldspathic litharenites confined to more distal areas underwent dissolution of feldspars and calcite cement, and developed the highest permeability and porosity (6-10%). Dissolution was favored by horizontal primary lamination commonly containing plant debris that, connecting the porosity to fractures, acted as permeable conduits for influx of dissolution agents.

The distribution of oil-producing fields in the area seems to be related to the best reservoir quality developed in feldspar-bearing intervals of distal facies with planar lamination. Therefore, an understanding of facies distribution, depositional architecture, and fracture systems produced by igneous activity is crucial for exploration and production strategies in the Chicontepec Basin.