4.4 UNDERSTANDING THE ORIGIN OF QUARTZ CEMENTATION IN SANDSTONES FOR BETTER PRE-DRILL RESERVOIR QUALITY PREDICTION

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ABSTRACT

Predicting and understanding the distribution patterns of diagenetic quartz cemented zones and their impacts on fluid flow within a reservoir unit is a crucial goal of reservoir characterization. Such prediction requires a comprehensive understanding of key factors. Qualitative and quantitative information on the thickness and completeness of coatings within various stratigraphic units and detailed knowledge of grain size is essential to making accurate predictions. The origin of silica cements is closely linked to the burial history, temperature, pressure, and composition of pore fluids within the sedimentary basin. Silica sources for quartz cementation could be derived from pressure dissolution of detrital quartz grains, feldspar and mica alteration, dissolution of chert, and clay mineral transformation reactions. Highly soluble biogenic silica from shale sequences is identified as an essential source of silica in some basins.

Clay coatings and micro-quartz are found to be key inhibitors to the nucleation and growth of quartz cements. Additionally, understanding the burial history of the reservoir is crucial. The type and grain size of detrital quartz grains plays a significant role in the extent of silica cementation. For example, monocrystalline quartz grains are more likely to have well-developed overgrowths, particularly in coarse sand sizes. These findings provide a better understanding of the diagenetic evolution in sandstone reservoirs and have important implications for reservoir quality prediction and hydrocarbon production.

KEYWORDS: Diagenesis, Quartz cementation, Sandstones, Reservoir Quality