

Distribution characteristics and geochemical significance of organic acids in deep and ultra-deep clastic reservoirs in the Eastern Junggar Basin

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In deep and ultra-deep detrital reservoir (burial depth > 4500 meters), secondary porosity is the predominant space for hydrocarbon storage, intricately linked to the dissolution process of water-soluble organic acids (WSOAs). However traditional theories surrounding secondary porosity primarily focus on medium-depth or shallow reservoirs without comprehensive exploration into how WSOA-driven mechanisms influence deeper strata formations. To address this gap, our research involved selecting 36 samples from Mesozoic Permian clastic rock formations located within western China's Fukang Sag situated within Junggar Basin region for detailed analysis using Soxhlet extraction method coupled with qualitative/quantitative analysis via 940 ion chromatography (Metrohm AG). These findings were then integrated with oilfield production data to investigate the sources, composition, distribution characteristics, and influencing factors associated with organic acids within deep and ultra-deep detrital reservoir. Our investigation revealed that WSOAs persist even within ultra-deep reservoir, where increased burial depths initially lead to a rise in WSOA concentrations followed by subsequent decline. Similarly, effective porosities mirrored these trends closely alongside variations observed across WSOA concentrations, while permeability remained consistently low yet stable throughout these transitions. This indicates significant involvement of WSOAs during dissolving processes contributing to the creation and maintenance of secondary pore spaces. Moreover, conspicuous positive correlations have surfaced, establishing a direct link between the concentrations of WSOA generation and corresponding shifts in formation pressures and temperatures. In deep and ultra-deep reservoirs, the concentration of organic acids exhibits an initial incline followed by a subsequent decline in response to escalating formation temperature and pressure.