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Application of pore throat characteristics research of deep-water globigerina limestones in acid fracturing effectiveness analysis: a case study of the Pearl River Formation in Baiyun Sag, Pearl River Mouth Basin

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Deep-water limestone reservoirs contain a large amount of oil and gas resources. Acid fracturing is an important technical means for the development of carbonate reservoirs, and the compatibility between the acid fracturing method and formation directly determines the development effect of reservoir. A large number of argillaceous and silty globigerina limestones deposited in deep-water environment on the continental slope are developed in the the Pearl River Formation in Baiyun Sag, Pearl River Mouth Basin. The limestones is composed of micrite, terrigenous debris, and bioclasts, dominated by biogenic cavities, with high porosity and low permeability physical characteristics. Acid fracturing diversion experiments with different acid liquid systems and acid injection methods did not significantly improve the fracture conductivity. Characterize the changes in pore throat structure before and after acid fracturing through casting thin section, micro-CT, electron probes, etc. The experimental results show the bio-cavity backfill corroded seriously with the bio-shell not corroded obviously ; for muddy interstitial materials widely developed in the reservoir, effective dissolution not occurred in acidic environment, exhibited typical high porosity and low permeability to ultra-low permeability characteristics, and the effect of acid fracturing transformation poor (the conductivity under 20MPa is less than 0.005 D·cm); easy to deform (especially under external pressure) due to particle point-contact relationship, argillaceous miscellaneous filled and poor cementation, further blocking the seepage paths. Under the tectonic background, source supply, and sedimentary environment, although carbonate mineral components are enriched, the acid fracturing dissolution effect shows obvious selective characteristics, which improves pore parameters but fails to effectively improve permeability, resulting in poor acid fracturing effect.

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