PORE SIZE DISTRIBUTION AND RESERVOIR EVALUATION OF THE EOCENE BEACH-BAR SANDSTONE, DONGYING DEPRESSION, CHINA BY USING MICP, NMR AND MICRO-CT

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Abstract

The pore size distribution and associated heterogeneities of thinly bedded beach-bar sandstone reservoir from upper fourth member of Eocene Shahejie Formation (Es4s) are characterized with the help of mercury injection capillary pressure (MICP) and nuclear magnetic resonance (NMR) transversal relaxation time ($T2_)$ data. Permeability and porosity are two represented important characteristics of rocks that control the movement and storage of fluids. The aim of this paper is to establish relationships between pore throat sizes and reservoir quality. The results derived from thin-section petrography, scanning electron microscopy (SEM), MICP, NMR T_2 relaxation time, and 3D micro-CT (μ-CT) are compared to characterize pore space dimensions and types comprehensively. The average pore throat size from MICP ranges between 0.47μm to 2.83 μm while the maximum pore throat size ranges between 2.48 μm to 7.36μm.The combination of pore size distribution obtained from MICP, NMR seems appropriate to cover the range of pore sizes from beach-bar sand and overcome the individual method limits. Afterwards, Digital 3D μ-CT tomographic images are used to characterize and visualize pore space and pore network model and compare those with the experimental data. MICP and NMR experiment show generally bimodal (meso and micro) pore size distribution. Usually mesopore corresponding to intergranular pores are dominant, while the heavily cemented sandstones show large amounts of intercrystalline micropores. Thus the evaluation of the complex and heterogeneous beach-bar sandstone reservoir requires a comprehensive study program.

Key Words: NMR T_2; MICP; Pore size distribution; porosity; 3D μ-CT; Pore network model.