Simulation experiments of carbonate reservoir modification by source rock-derived acidic fluids

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Deep and ultra-deep carbonate reservoir is the important area of petroleum exploration. However, the prerequisite for predicting high quality carbonate reservoirs lays on the mechanism of carbonate dissolution/precipitation. It is optimal to perform simulation experiments to clarify if burial dissolution could improve the physical properties of carbonate reservoirs. In this study, a series of experiments were conducted with the limestone from the Ordovician Yingshan Formation in the Tarim Basin, and the low maturity source rock from Yunnan Luquan, in a self-designed hydrocarbon generation-dissolution simulation equipment. The results showed that: in the burial stage, organic acid, CO_2 and other acidic fluids associated with thermal evolution of deep source rocks could dissolve carbonate reservoirs, expand pore space, and improve porosity. Dissolution would decrease with the increasing burial depth. Whether the fluid could improve reservoir physical properties largely depends on calcium carbonate saturation, fluid velocity, water/rock ratio, original pore structure etc. This study could further contribute to the prediction of high quality carbonate reservoirs in deep and ultra-deep layers.