Mesogenetic Dissolution Could Significantly Enhance the Performance of Carbonate Reservoirs: Evidence from Experimental Simulation

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Dissolution in the mesogenetic or deep-burial environment in carbonate reservoirs is becoming widely recognized [1,2,3]. However, it still remains controversial whether mesogenetic dissolution could significantly enhance the performance of carbonate reservoirs [2,4].

To quantitatively evaluate the effect of mesogenetic dissolution in the carbonate reservoirs, we designed and manufactured a set of dissolution simulation device. In order to get closer to the actual geological conditions, we use the method of allowing acidic fluids to flow through the interior of the rock sample under a certain pressure, instead of the surface dissolution methods commonly used in the past, to carry out the dissolution simulation experiments. A series of temperature and pressure values are set, and the heating time for each one is 30 minutes. The results reveal that: (1) The PH values of the acetic acid solution did not significantly decrease under high temperature and pressure, indicating that the acetic acid most likely is not decomposed; (2) The molar concentration values of Ca^{2+} and Mg^{2+} in the reactive solution just had a little decrease with the increase of temperature and pressure, showing that intensive dissolution occurs in the deep-burial environment; (3) Mesogenetic dissolution could significantly enhance the performance of carbonate reservoir rocks. The porosity and permeability values of samples significantly increased by 4%-6% and 7%-877%, respectively after the experiments. Moreover, for the samples with the permeability values of < 0.01md, the acidic fluid can't flow through them even with a higher driving pressure, showing that the carbonates with poor original physical properties are hard to be altered into good reservoirs.

[1] Bathurst (1986) Quarterly Colorado School of Mines **81**, 1-25. [2] Mazzullo & Harris (1992) *AAPG* **76**, 607-620. [3] Moore & Druckman (1981) *AAPG* **65**, 597-628. [4] Ehrenberg *et al* (2012) *AAPG* **96**, 217-233.