Physical Simulation on Mechanism of Hydrocarbon Migration and Entrapment in Deep Zones with High Temperature and Overpressure

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In order to understand better the mechanism of hydrocarbon migration and entrapment in deep zones, we designed a 1-D physical experimental model that can bear high temperature and pressure; i.e., the core displacement experimental apparatus, to simulate oil migration and accumulation in deep zones.

This experimental apparatus is composed of fluid input/output system, experimental noumenon, and T/P controlling system; the system includes data gathering and analyzing. The T/P conditions during experimental simulation are strictly in accordance to the geological setting of Bonan sub-sag that is located in Shengli Oilfield. Based on the above measurements, the actual high temperature and overpressure in core fluids buried at depths of several kilometers can be simulated while the corresponding core samples are selected from Well Y172 of Bonan sub-sag.

The first stage in the experimental flow is to inject fluids composed of oil, water, and gas into a constant-temperature oven, containing core clamp holder and flowmeter, by using ISCO pump made in U.S.A. The process is repeated until the requisite time is reached. Then the volumes of oil, water, and gas, respectively, are calculated and recorded. The final step is to process the data recorded by HP data-collecting system and to develop imaging by use of image-processing system.

The primary aims of this experiment are as follows:
1. Describe the characteristic of the hydrocarbon phase changing within an overpressure system.
2. Map channels and migration paths for hydrocarbons in deep zones.
3. Summarize characteristics of hydrocarbon migration and accumulation within the geological system with high temperature and overpressure.