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New insights into the effects of crude oil composition on the oxidation behavior through TG/DTG/DTA tests and oxidation tube experiments

Jin-Zhou Zhao and Hu Jia Southwest Petroleum University, China

Enhanced oil recovery (EOR) is the major concern for oil companies due to the high demand of fossil fuels. Currently, highpressure air injection (HPAI) in light oil reservoirs has received considerable attention as an effective enhanced oil recovery process. Low-temperature oxidation (LTO) behavior is the main concerned factor affecting the recovery performance when implementing HPAI. Recently, we carried out series of TG/DTG/DTA tests and oxidation tube experiments to study the effects of crude oil composition on the oxidation behavior. Four types of crude oil (3.7-70 mPa.s at 25 °C) taken from Jilin oil field (Jilin province, China) were chosen in our study. Results show that high content C7-C14 hydrocarbons can provide negative effect on the low-temperature behavior of crude oil. On the contrary, the high content unsaturated hydrocarbon including resins, asphaltenes, aromatics as well as C_{15+} are benefit for the oxidation performance, showing high carbon-carbon bond stripping reaction in oxidation tube experiments which is expressed in the specific characteristic of high content CO_2 . This is the favourable indication for crude oil autoignition when application HPAI. However, the relative contents range of the unsaturated hydrocarbon should be determinate in later study. Beyond that, we find that the representative saturated hydrocarbon C_{15+} is the main components to take into oxidation reaction which can split into light components to promote the flow performance of subterranean crude oil. The obtained new findings of our study are very promising to broaden the application of HPAI in oil reservoirs with low to middle viscosity.

Biography

Jin-Zhou Zhao is the Vice President of Southwest Petroleum University (SWPU) and also a professor in the department of petroleum engineering at SWPU. He earned his B.S. degree in July, 1982, and M.S. degree in July, 1985 from SWPU, both in petroleum engineering. He is a prestigious scientist in the field of petroleum engineering, and has been a prolific researcher and developer of new technologies over a 30-year career that has led to important advances in petroleum engineering technologies. He has published over 100 papers in peer-reviewed journals, and authored more than 7 books, and holds 15 Chinese patents.

qiaojl@dhu.edu.cn