

Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Quantitative assessment model of gas generation of sapropelic organic matter constrained by expulsion efficiency

LI JIAN*^{1,2}, HAO AISHENG^{1,2}, LI ZHISHENG^{1,2}, MA WEI^{1,2},
WANG YIFENG^{1,2}

¹ PetroChina Research Institute of Petroleum Exploration & Development, Langfang, 065007, China

² Laboratory of Gas Reservoir Formation & Development, CNPC, Langfang, 065007, China

Increased proven gas reserve has been discovered in deep to ultra-deep formations in recent years in China. Gas types of deep to ultra-deep gas are kerogen cracking gas, occluded liquid hydrocarbon cracking gas and expelled liquid hydrocarbon cracking gas. Deep to ultra-deep gas exploration requires detailed quantitative assessment model of gas generation. In this paper, detailed quantitative assessment model of gas generation was established through three kinds of work. (1) Quantitative assessment model of occluded hydrocarbon and expelled hydrocarbon was established by semi-open hydrocarbon generation and expulsion experiment. (2) Total gas yield, occluded liquid hydrocarbon cracking gas yield and kerogen cracking gas yield at different mature stages were simulated by closed hydrocarbon generation experiment. (3) Gas hydrocarbon cracking process was established by simulation experiment.

(1) For source rocks with type I and II 1 kerogen, expulsion efficiency is lower than 20% at early stage ($R_o < 0.8\%$), 20% ~ 50% at oil-condensate window ($R_o 0.8\% \sim 1.3\%$) and 50% ~ 80% at high mature stage ($R_o 1.3\% \sim 2.0\%$). Quantitative assessment of occluded hydrocarbon can offer key parameter for shale oil and gas evaluation.

(2) Before oil generation window, nearly all gas is cracked from kerogen. Ratio of oil cracking gas increases sharply during high mature stage. At over mature stage, ratio of kerogen cracking gas increase slowly until hydrocarbon potential exhaustion. At high to over mature stage, ratio of kerogen cracking gas, occluded liquid hydrocarbon cracking gas and expelled liquid hydrocarbon cracking gas are 20%, 15% and 65% respectively. Considering hydrocarbon expulsion efficiency, kerogen cracking gas may contribute a lot to shale gas at high to over mature stage.

(3) Gas hydrocarbon cracking process. C_2H_6 , C_3H_8 and C_4H_{10} cracked at maturity from $R_o 1.8\%$ to $R_o 3.5\%$. CH_4 starts to crack at maturity with $R_o 5.0\%$.

This study is Supported by National Science & Technology Major Project (2016ZX05007-003); The Strategic Priority Research Program of the Chinese Academy of Sciences (XDA14010403); China Petroleum Science and Technology Project (2016B-0602).