

# Organic geochemistry of a potential precursor for petroleum generation: Devonian Liptobiolith in Luquan, southwestern China

WENBIN LIU<sup>1,2</sup>, XIANCAI LU<sup>2\*</sup>, JIANZHONG QIN<sup>1</sup>, LI ZHIMING<sup>1</sup>, AND HU KAI<sup>2</sup>

<sup>1</sup>Wuxi Research Institute of Experimental Geology, SINOPEC, Wuxi, Jiangsu 214151, P. R. China

<sup>2</sup>Department of Earth Sciences, Nanjing University and State Key Laboratory of Mineral Deposit Research, Hankou Road 22, Nanjing 210093, P. R. China; e-mail: xcljun@nju.edu.cn

The cutinitic liptobiolith in Luquan area, southwestern China, is the representative Devonian coal. But its occurrence is mainly lenticular strata sandwiched between sandstones and argillaceous rocks, and the total carbon content ranges around 46 wt%, which makes it a type of low grade coal. In this study, its potential as the precursor of petroleum was investigated using multiple geochemical analysis, including organic petrological study, isotope geochemistry, pyrolysis, chloroform extraction and chromatogram analysis of soluble organic fraction. The content of cutinite and vitrinite are the dominant macerals, and sporinite is the accessory one. The fluorescence spectrum analysis indicates that the cutinite is enriched in hydrogen evidently.  $\delta^{13}\text{C}_{\text{PDB}}$  of kerogen, saturation hydrocarbon and aromatic hydrocarbon are -20.39‰, -19.55‰ and -19.33‰, respectively. The atomic ratio of H/C and O/C are 1.17 and 0.13, which is similar to type II kerogen. The organic sulfur is 0.928 wt%. In addition, the  $T_{\text{max}}$  of the pyrolysis and  $P_r/P_h$  of the fraction of saturation hydrocarbon are 440 °C and 7.967. All the results suggest that the cutinitic liptobiolith is a low maturity and hydrogen-rich coal. In order to evaluate its potential for petroleum generation, an experiment of thermal simulation was designed and carried out. The decomposing stages were finely recorded and investigated, and the production of gas and condensed oil were measured as 658.4 m<sup>3</sup> and 78.5 kg per ton organic carbon. Such a high production of petroleum suggests that Luquan cutinitic liptobiolith could act as an important oil precursor in the diagenesis of Devonian clayey rocks. Furthermore, we found that the activation energy measured as 60.0~70.00 kcal/mole is relatively high, which makes the coal sensitive to the thermal evolution. In summary, cutinitic liptobiolith can be an important precursor although the kinetic mechanism of petroleum generation is not well comprehended yet.

## Acknowledgement

Authors acknowledge the National Science Foundation of China (No. 40373024).