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NMR Study on Microscopic Pore Characteristics of Coals of Different Coal Ranks

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Extended Abstract

The microscopic pore structure of coal directly affects the adsorption and permeability of coal, while the coals of different coal ranks have significantly different microscopic pore structures. In this paper, the microscopic pore structure difference of coals of different ranks was studied by combining low temperature liquid nitrogen and nuclear magnetic resonance technology. The results showed that the desorption curve of high rank coal (ZM) was significantly inflected at (0.5 P/P_0) and that of medium/low rank coal (XJ, HB, SX) was not inflected at (0.5 P/P_0). High rank coal contains more "ink-bottle"-shaped pores and slit pores, with complex pore system and poor connectivity between pores; while low\intermediate rank coal contains more open pores, with simple pore system and good connectivity between pores. NMR test showed that the micro pores (<10nm) of low/medium rank coal accounted for about 20% of the total pores, which was significantly lower than that of high rank coal (about 70%); however, the macro pores of low/medium rank coal accounted for about 10% of the total pores, which was higher than that of high rank coal. The T_2 spectrum of low-rank coal (XJ) presents a continuous three-peak distribution, and the total area of T_2 spectrum is 13400 (dimensionless). The T_2 spectrum of medium rank coal (HB, SX) shows bimodal and trimodal distribution (where bimodal distribution is dominant), with a total area of T_2 spectrum being 3040. High coal rank (ZM) presents a bimodal distribution, with a total area of T_2 spectrum of 19080. This study provides a theoretical basis for the exploration and development of coal bed gas and the safety production of coal mine.

***Keywords*:** Different coal rank, pore structure, microstructure, low temperature liquid nitrogen, NMR.

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