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METHANE EMISSION FORM FOSSIL COAL UNDER INCREASED MOISTURE CONTENT

Effect of water on methane emission from porous structure of coal is studied by proton NMR and thermo-gravimetric analysis. Watering effect on sorption properties of a porous sorbent, i.e. fossil coal, is considered. The investigation is aimed at evaluation of the change of activation energy of methane desorption with respect to the dry check samples. Long-flame coal of early stage of rank was used for tests. Desorption time dependence of the width of NMR line and mass loss of the methane-saturated sample were measured in the wide temperature range from –155 to 80°C. It was demonstrated that activation energy of the CH_4 emission from a moistened sample was less that of dry coal. Physical mechanism of acceleration of methane emission under high pressure in deep coal mines is active role of H_2O molecules that substitute CH_4 at active sorption centers of the surface of threshold space of coal.

The investigation allows statement that at great depth (800–1500 m), under high pressure and temperature of watered coal beds, conditions of advanced gas release are formed due to redistribution of fluids adsorbed at pore walls. Among other factors, reduction of the binding energy of CH_4 results in increase in the effective diffusion coefficient, that characterizes the rate of gas release.

Keywords: moisture, methane, coal, activation energy, NMR

Fig. 1. Arrhenius plot of the time of spin-spin relaxation $T_2 \sim 1/\Delta H$ for three components of the system of coal (*1*)–water (*2*)–methane (*3*) for long-flame coal. E_a, kJ/mol: *2* – 11.6, *3* – 4

Fig. 2. Moisture dependence of self-diffusion coefficient of water in pores of long-flame coal