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Analysis of Gas Transport and Sorption Processes in Coal under Confining Pressure Conditions

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Abstract : A substantial majority of gas transport and sorption researches into coal are carried out on samples that are free of stress. In natural conditions, coal occurs at considerable depths, which often exceed 1000 meters. In such conditions, coal is subjected to geostatic pressure. Thus, in natural conditions, the sorption capacity of coal subjected to geostatic pressure can differ considerably from the sorption capacity of coal, determined in laboratory conditions, which is free of stress. The work presents the results of filtration and sorption tests of gases in coal under confining pressure conditions. The tests were carried out on the author's device, which ensures: confining pressure regulation in the range of 0-30 MPa, isobaric gas pressure conditions, and registration of changes in sample volume during its gas saturation. Based on the conducted research it was found, among others, that the sorption capacity of coal relative to CO_2 was reduced by about 15% as a result of the change in the confining pressure from 1.5 MPa to 30 MPa exerted on the sample. The same change in sample load caused a significant, more than tenfold reduction in carbon permeability to CO_2. The results confirmed that a load of coal corresponding to a hydrostatic pressure of 1000 meters underground reduces its permeability and sorption properties. These results are so important that the effect of load on the sorption properties of coal should be taken into account in laboratory studies on the applicability of CO_2 Enhanced Coal Bed Methane Recovery (CO_2-ECBM) technology.

Keywords : coal, confining pressure, gas transport, sorption
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