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Effects of Temperature and Constraint Conditions for the Behavior of the Coal Injected CO_2

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In order to demonstrate for CO_2-ECBM in Japan, CO_2injection test was conducted in Yubari Shu-paro mine targeted for the coal bed of underground 1000m, and it was confirmed that the CO_2 injection rate was lower 1 order than the expected rate and that only a short time indicates the effect of N_2injection relatively to improve CO_2injection rate. It's considered coal absorbs CO_2, swelling and closes the cleats which becomes flow pass of CO_2as the cause which has low CO_2 injection rate, and that the permeability falls. By the way CO_2absorbed amount of coal indicates negative correlation in the temperature, so when becoming hot, absorbed CO_2attaches or removes it, and there is a possibility that swelling is reduced.
Coal, water, $CO_2$and N_2 were ruled by the temperature, pore pressure and constraint conditions and indicated complicated behavior in Yubari. In this study, the temperature changed by 25, 40 and 50 degree C of 3 stages at pore fluid of the coal of CO_2 and N_2 and warped in a stress constraint condition and strain constraint condition, and a change in confining pressure and Vp was measured.
It was made stress constraint condition by the pore pressure 10MPa and confining pressure 12 MPa by N_2 saturation and the temperature was changed by the pattern of 40 > 50 > 40 > 25 > 40 degree C. After supercritical CO_2 injection, the temperature was changed by the same pattern. For example the swelling strain of an average of about 480 x 10^{-6} was measured by N_2 saturation and the swelling strain of an average of about 140 x 10^{-6} was measured by CO_2 saturation to 15 degree C of differential temperature in the temperature rise test. Positive correlation can admit pore fluid in the temperature and the strain in N_2 , pore fluid, the correlation is low in CO_2 . 31.6 x 10^{-6} /degree C and pore fluid are estimated by rate of thermal expansion in super-critical CO_2 at 6. 7 x 10^{-6} /degree C for the rate of thermal expansion which can put pore fluid in N_2 . There is a possibility that a shrinkage by thermal expansion with differential temperature in the temperature rise test and absorbed amount decline of CO_2 is offset by the latter.
It was made strain constraint condition by the pore pressure 10MPa and confining pressure 12 MPa by N_2 saturation and the temperature was changed by the pattern of 40 > 50 > 40 > 25 > 40 degree C. After supercritical CO_2 injection, the temperature was changed by the same pattern. For example about 1.7 MPa of confining pressure increase was measured by N_2 saturation and about 8.3 MPa of confining pressure increase was measured by CO_2 saturation to 15 degree C of differential temperature in the temperature rise test. Thermal expansion tries to make the pore the coal by which was saturated with CO_2 and N_2 with differential temperature in the temperature rise test, but it increases in confining pressure to restrain swell by strain constraint condition. That bulk modulus and coefficient of thermal expansion are high can consider to the former as the reason higher than correlation that pore fluid can put correlation between the temperature in CO_2 and confining pressure in N_2 . As a change in Vp indicates the liquid look by about 10 MPa and indicates one the super-critical look by 25, 40 and 50 degree C in CO_2 about the small cause in CO_2 , and there is a possibility that the several physical properties change big, and Vp of a CO_2 element changes the temperature, though increases in confining pressure in the coal test piece

which makes CO_2 pore fluid, pore fluid can think that whole Vp doesn't change to assume to fluctuate big. There is more CO_2 absorbed amount of coal in the temperature and negative correlation, so when I rise, attaches or removes CO_2 from a coal matrix, and the temperature indicates the shrinkage tendency, and an offset possibility is regarded as thermal expansion.

Keywords: CO_2-ECBM, temperature, constraint condition, Vp, swelling, adsorption