Ecbm test of [co] 2-ecbm apparatus units

Science

EXPERIMENTAL OF [CO]_2-ECBMAPPARATUS UNITS

ECBM test is carried out with an apparatus which consists of three (3) main parts, namely:

The Injection Unit

This unit comprises of a high pressure Ruska Gas Cylinder which is initially with Injection gas at a recommended pressure; pump will be used to inject water into the gas cylinder from the under point (bottom). The water and gas will be separated by the floating piston in the gas cylinder, which is also equipped with a circular- ring to keep the safety seal intact during the piston movement to avoid leakage.

The Core – Holder Unit

This unit is positioned horizontally and houses an oven maintained at a constant temperature of about25

(0) C . This temperature is approximately the field temperature of coal seam under study (Zhou et al. 2013). To ensure proper flow within the coal seam sample, a confining or an enclosed pressure is applied on the core

The Production Unit

This unit will be made up of or comprises of a regulator called Back Pressure Regulator (BPR) which maintains pre – adsorption pressure; a metre will be used to record total gas flow rate; Gas Chromatograph (GC) used to measure the composition of produced gas. A gas sample is collected at atmospheric or ambient pressure using a syringe and a vial, and input to Gas

Chromatograph. The gas compositions will be determined using a column HP – Plot Q Gas Chromatograph known as Agilent 7890.

Its calibrations with pure gases demonstrates different retention time of Methane (CH_4) and Carbon IV Oxide (CO_2) respectively (Zhou et al. 2013)3. 0. 1: GAS SPECIMEN: (CO_2) gases and methane(CH4) . 3. 0. 2: Core Samples: 3. 0. 2: EXPERIMENTAL METHOD / PROCEDURE: An experimental method similar to that reported by Connell et al.(2011) s applied for the ECBM experiments. In comparing with Connell et al., procedures, this study differs in its injection compositions . Connell et al. (2011) used pure Nitrogen (N_2), Flue gas of about 87% N2 by mole and Methane (CH_4) while pure CO_2 and N_2 was used directly to observe the effect of CO_2 injection on incremental CH_4 recovery and CO_2 storage in this experiment. Furthermore Connell et al.(2011) used both nitrogen and carbon dioxide as an injection fluid while we use only CO_2 as injection fluid. Outlined Procedures: To ensure good results, the outlined experimental procedures include: Locate the coal sample to be used into the Core – holder unit. Then set and maintain the oven temperature at 25

0 c.

Remove the residual air from the coal sample for about 12 hours using vacuum method. Apply the recommended confining pressure on the sleeve that covers the coal sample. Maintain the pore pressure in the core sample, then inject pure Methane (CH_4) and allow gas adsorption to reach equilibrium. Set the pump to inject water (H_2O) into the Ruska gas Cylinder at the same pressure. Measure the volume of water injected and should be approximately equivalent to the amount of Methane (CH_4) adsorbed into the coal sample.

Maintain the pore pressure using the BPR and inject pure CO_2 into the coal samples. The gas in the cylinder is displaced by water injection at a constant rate (figure 3). Monitor the gas inflow and outflow (with accuracy of ±0. 5% of the flow rate). Then measure the effluent gas composition using the GC. Record the injection pressure with a precision of 35 KPa. At a steady – state concentration when the outflow concentration and rate is equal to the inflow, hence terminate the experiment.