CO_2 adsorption into coal measured by GASPRO

INTRODUCTION

In addition with the research for alternatives to reduce the use of hydrocarbon, every realistic future scenario confirms the continuous use of fossil fuel and thus the release of carbon dioxide (CO_2) in the atmosphere. Therefore high research effort is needed to find ways to efficiently store CO_2. Unminable coal bed are foreseen as potential solution for a sustainable storage. This application note shows the results of CO_2 adsorption on two coal samples using the manometric technique.

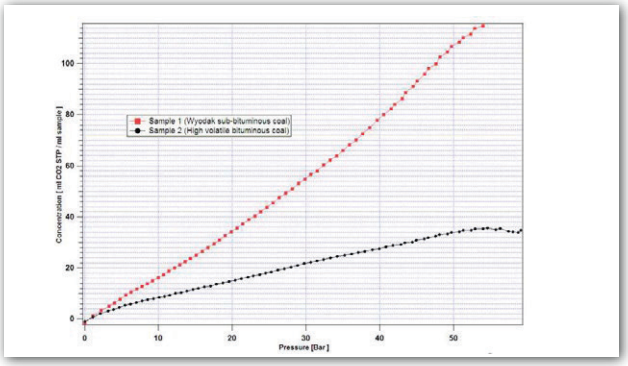

Figure 1: CO_2 sorption isotherms at 40°C for Illinois bituminous coal and Wyodak subbituminous coal.

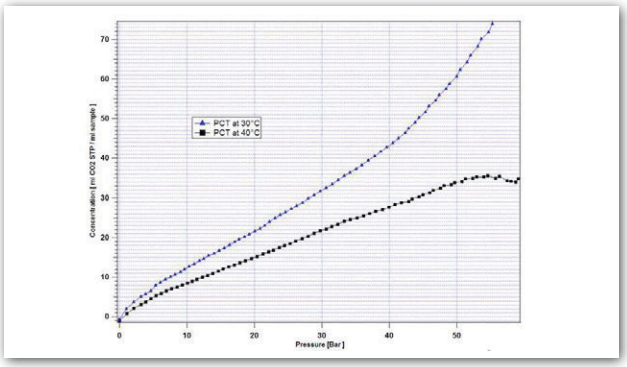

Figure 2: Comparison of the CO_2 isotherm of Illinois bituminous coal run at 30°C and 40°C

EXPERIMENT

Approx. half of a gram of the different coals in powder form (100 mesh) have been introduced in the standard sample holder (400°C/200 bar) of the GASPRO. After initial evacuation and subsequent volume calibration of the dead volume with helium, the pressure-composition temperature (PCT) isotherm of CO_2 on these coals were measured with the GASPRO.

RESULTS AND CONCLUSION

The samples show very different behaviours in term of CO_2 uptake as it can be noticed on the figure 1 at 40°C. The sub-bituminous coal shows a much higher uptake. It is also noticed that the saturation is reached for the bituminous coal. For the sub-bituminous coal the CO_2 pressure was lower, but we can predict that saturation appears at the same pressure, as the beginning of an inflexion of the curve is detected. The comparison of the CO_2 uptake for the bituminous coal at different temperatures is shown on figure 2. The isotherm at lower temperature demonstrates that the saturation limit disappears in the studied pressure range.The GASPRO is well-suited for the detailed characterization of materials used in the study.

INSTRUMENT

GASPRO

-260°C to 500°C

WIDE TEMPERATURE RANGE ENABLING A VARIETY OF APPLICATIONS
from sub-ambient operations up to 500+ °C with a customized solution

VARIETY OF MODES OF OPERATION
ability to combine PCT, kinetics and cycle-life modes to 200 bar to determine the quantity and rate of sample/gas interaction and its ageing characteristics all in one instrument and operation

HIGH ACCURACY
to reduce cumulative error across multiple measurements points

PRECISION MEASUREMENT OF SMALL SAMPLES
using the patented microdoser option (US8132476)

EXTERNAL CALORIMETER COUPLING CAPABILITY

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