Methane adsorption into coal measured by the GASPRO

INTRODUCTION

Coalbed methane is an important source of energy in many countries. In contrast to a conventional gas reservoir, methane is stored by adsorption in to pores of the coal. In underground coal mining, it presents serious safety risks and is one of the main cause of coal mine accidents. Thus characterization of methane uptake in coal is essential to the development of new technologies to harness energy while mitigating environmental and underground mining risks. This application note shows the results of methane adsorption and desorption measurements on a coal sample at room temperature and up to 150 bar.

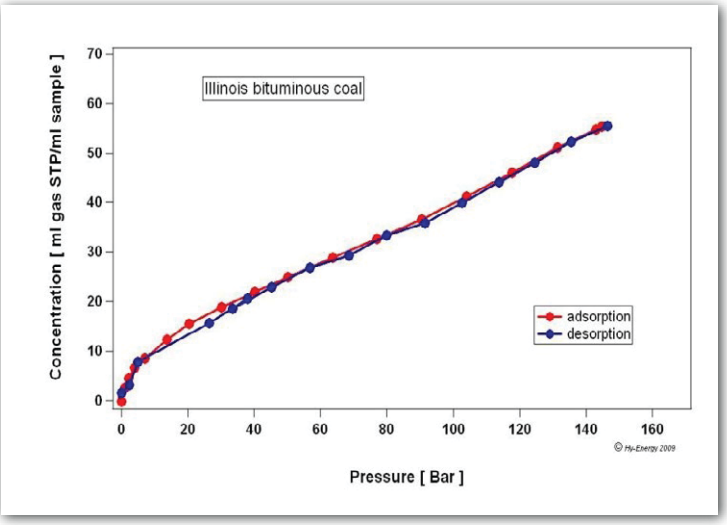

Figure 1: CH_4 adsorption and desorption isotherms for Illinois bituminous coal at 25 °C

EXPERIMENT

CH_4 adsorption into a bituminous coal sample was measured at 25°C using a GASPRO Sievert's apparatus which was developed to study sorption of a variety of gases from vacuum up to 200 bar and from liquid He to 500°C. Gas density temperature correction was done automatically by measuring the apparentfree gas volume at temperature using helium. The density of the entire sample was assumed to be 1.4kg/m^3.

RESULTS AND CONCLUSION

The PCT isotherms of CH_4 adsorption and desorption for Illinois bituminous coal are shown in Figure1. The methane uptake is two times lower than that of CO_2 reported for the same sample in AN654. Methane physisorbs into coal, thus its uptake depends on pore volume available in coal. The measured methane uptake of 20ml gas STP/ml sample is consistent with literature values for similar coal samples (4-25ml gas STP/ml). The GASPRO is well-suited for the detailed characterization of coal 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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