

Methane adsorption into coal measured by the PCTPro E&E

Introduction

Coalbed methane is an important source of energy in many countries. In contrast to a conventional gas reservoir, methane is stored by adsorption into pores of the coal. In underground coal mining, it presents a serious safety risk and is one of the leading causes 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.



Experimental

CH₄ adsorption into a bituminous coal sample was measured at 25 °C using a PCTPro E&E 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 apparent free gas volume at temperature using helium. The density of the entire sample was assumed to be 1.4 kg/m³.

Results and discussion

The PCT isotherms of CH₄ adsorption and desorption for Illinois bituminous coal are shown in Figure 1. The methane uptake is two times lower than that of CO₂ 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 20 ml gas STP/ml sample is consistent with literature values for similar coal samples (4-25 ml gas STP/ml). The PCTPro E&E is well-suited for the detailed characterization of coal used in the study.

Figure 1. CH₄ adsorption and desorption isotherms for Illinois bituminous coal at 25 °C

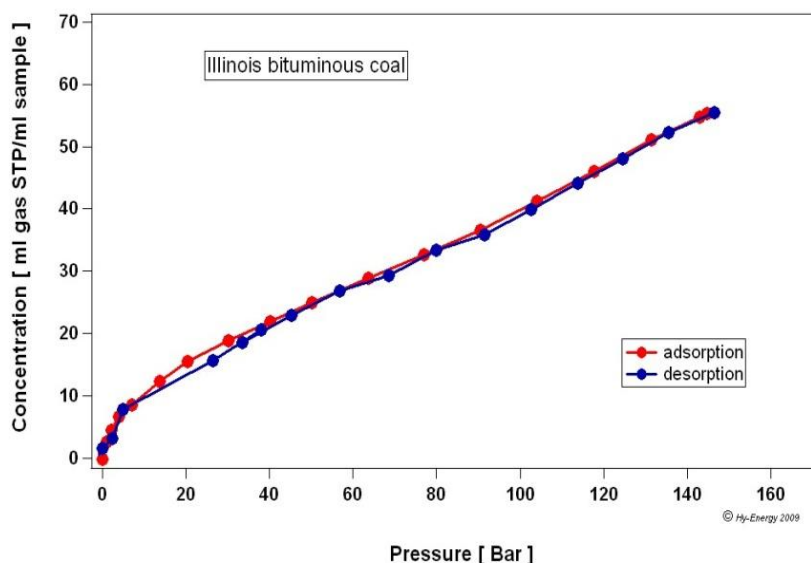


Figure 2. PCTPro-E&E Sievert's apparatus

