Modelling of methane and carbon dioxide sorption and sorption-induced coal expansion

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Abstract

The aim of the study was to investigate the ability of stretched exponential kinetic equation to describe the sorption kinetics and expansion rate of solid coal sample. In order to address this issue the sorption kinetics of methane and carbon dioxide on bituminous coal was studied. At the same time, the changes occurring in the sample's overall dimensions, which accompanied sorption processes was monitored. Experiments were carried out at high pressure by means of the volumetric method on cuboid solid samples. Stretched exponential equation (SE) modeling approach and equation is proposed to fit the kinetic curves of gas deposition, as well as the adequate kinetics of coal swelling. Compared to the other models described in the literature, stretched exponential equation seems to give the best fit to the experimental data. For the experiment, specially designed equipment was used, enabling parallel measurements of sorption and dylatometric characteristics of coal samples. Sorption capacity is measured by the manometric method. The device is placed in a water thermostat. Methane of known volume and pressure is decompressed and subsequently flows from the reference cell to the sample cell, containing the coal sample. Strains in cuboid-shaped coal samples are measured with a strain gauge. Linear deformations are controlled by an electric resistant wire combined with a resistance transducer.

Biography

Katarzyna Czerw completed her PhD in 2014 at AGH University of Science and Technology. She currently holds the position of Assistant Professor at the AGH University of Science and Technology, Faculty of Energy and Fuels, Department of Chemistry of Carbon and Environmental Sciences. The area of her scientific research is physical chemistry of coal, particularly sorption phenomena in mine gas-coal system and sorption induced swelling of coal. In the last two years she has published 5 papers in reputed journals.

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