Geophysical Research Abstracts,
Vol. 11, EGU2009-5553, 2009
EGU General Assembly 2009

Methane and carbon dioxide adsorption capacity of bituminous coals from the Ostrava-Karvina Coal District, Upper Silesian Basin, Czech Republic

P. Weniger (1), A. Busch (2), B.M. Krooss (1), J. Francu (3), and E. Francu (3)

(1) Institute of Geology and Geochemistry of Petroleum and Coal, RWTH Aachen University (weniger@lek.rwth-aachen.de), (2) Shell International Exploration and Production B.V., Netherlands, (3) Czech Geological Survey, Leitnerova 22, 65869 Brno, Czech Republic

In the context of a joint Czech-German project, experimental and analytical methods are being applied to improve the understanding of compositional variation of coal-related gas in the SW part of the Upper Silesian Basin (Czech Republic). According to present understanding, the gas composition is controlled by generation (thermal vs. microbial), migration and adsorption/desorption processes. In particular the effects of the sorption processes on the chemical and isotopic composition of coal gases are only poorly explored. During the first stage of this project, the gas adsorption capacity has been determined for coal samples representing the paralic Ostrava Formation (Namurian A) and the limnic Karviná Formation (Namurian B-C). For this purpose, high pressure adsorption isotherms have been measured for methane and carbon dioxide on medium and low volatile bituminous coal (VR_r 1.2-1.8%) from the production face of two collieries in the study area. Adsorption isotherms have been measured for pressures up to 25 MPa for CO_2 and up to 17 MPa for methane at 20˚C and 45˚C. Isotherms were measured on dry, moisture-equilibrated and "as received" samples (moisture content: 0.5-1.7%, mineral-matter-free) using a manometric method. Sorption capacities for CH_4 at 45˚C ranged from 18 to 27 Std. cm^3/g (0.7 to 1.1 mmol/g) coal, dry ash-free (daf), showing an increase of sorption capacity with increasing coal rank. For CO_2, sorption capacities were generally higher than for methane, ranging from 35-40 Std. cm^3/g (1.4-1.7 mmol/g) coal (daf). Equilibrium moisture contents, determined by a modified ASTM method, were significantly higher than the "as received" moisture. Sorption capacities measured on moisture-equilibrated samples were generally lower than those measured on dry or "as received" samples. Methane excess sorption isotherms show a type I Langmuir form and could be approximated using the Langmuir function. Excess sorption isotherms for CO_2 show a decrease in the pressure region close to the critical point and require a modified approximation that takes into account the density of the adsorbed phase. Calculated density values for the adsorbed phase ranged between 1.1 and 1.2 g/cm^3. Results of the sorption experiments will be presented and discussed in the context of coal rank and composition and in comparison with coals from other regions.