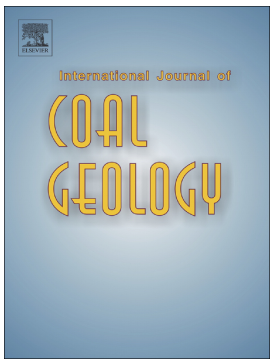

Methane sorption and storage characteristics of organic-rich carbonaceous rocks, Lurestan province, southwest Iran

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Abstract

High-Pressure-High-Temperature methane sorption isotherms have been measured on nineteen samples from the Jurassic Sargelu and the Cretaceous Garau formations in Lurestan province, southwest Iran. Measurements were performed on dry and moisture-equilibrated samples. The study aimed at investigating the effects of pressure, temperature, organic matter and water content on sorption and gas storage characteristics.

On the dry samples sorption isotherms were measured between 45 and 130°C at pressures up to 25 MPa. Isotherms for the moisture-equilibrated samples were measured at 45°C. An excess sorption function based on the Langmuir model was used to fit the experimental data.

The total organic carbon (TOC) contents of the Garau samples range between 0.18 and 5.41 wt% and those of the Sargelu samples vary between 0.23 and 15.91 wt%. Carbonate is the dominant mineral in both sample sets, followed by quartz and clay minerals. No clear correlation was found between TOC content and porosity of the samples, indicating multiple factors controlling the abundance and volumes of both organic and inorganic pores.

A linear correlation between sorption capacity and TOC value was found for both sample sets. Due to the larger variance in TOC values this relationship was more obvious for the Sargelu samples. Clay minerals constitute only a minor component of these carbonate-rich rocks. Therefore, as expected, no correlation was observed between sorption capacity and clay content. Organic matter content thus is the pivotal factor controlling methane sorption capacity.

With increasing temperature the excess sorption capacity decreases while the Langmuir pressure increases, as evidenced by decrease in the initial slope of the isotherms.

A negative correlation was observed between water content and sorption capacities and a positive correlation between water content and the Langmuir pressure (P_L).