The Effects of Maceral Composition on Coalbed Methane Reservoir Properties: Differences between Australian and Northern Hemisphere Coals

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A variety of influences affect gas reservoir properties of coal, and a thorough understanding of their relationships are critical for coalbed methane (CBM) exploration and production programs. One of the controlling factors on sorption capacity and gas content is maceral group composition, but different relationships have been found in different investigations. For example, several studies on Northern Hemisphere coals have shown that vitrinite-rich coals have higher sorption capacities than inertinite-rich coals but some studies have shown no systematic variation and others have indicated that, at low ranks, some inertinite has a higher sorption capacity than vitrinite. Analyses of organic petrology, sorption isotherms, and gas contents for a suite of coal samples from boreholes in the Sydney Basin, Australia allow a comprehensive investigation of the relationships between reservoir characteristics and coal composition. On the basis of data from Australian cases, the CH4 sorption capacities show no systematic variation between inertinite- and vitrinite-rich coals of similar rank. This lack of relationship is most likely due to the Australian coals containing an abundance of semifusinite that has sorption capacities similar to those of vitrinite. The results also show that gas contents and vitrinite abundance are negatively correlated. This relationship is mostly likely caused by an elevated permeability of vitrinite-rich coals, leading to gas leakage and undersaturation. Because relationships between maceral group contents and reservoir properties may vary between, and within CBM exploration acreage, predictions on prospectivity and producibility on the basis of published findings are likely to be misleading. In addition, other factors, such as thermal history, pressure, hydrodynamics and regional stress may overwhelm the effects of coal composition and these also need to be considered in prospect evaluation.