Laboratory Experiments at Reservoir Pressure and Temperature of the Biogenic Methane Potential of Coal Seam Reservoirs

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Abstract

Methane generation by microbial activity, or biogenesis, is a significant source of coal bed methane (Faiz and Hendry, 2006; Strąpoć et al., 2011). Being able to stimulate methane generation within a coal seam reservoir has the potential to add significant value to depleted or undersaturated fields. Several laboratory studies have demonstrated that this process can be stimulated by the addition of inorganic nutrients (Jones et al., 2010; Midgley et al., 2012a,b). These studies, performed at atmospheric pressure on crushed coal, provide encouraging support for the concept of inducing in-situ biogenic methanogenesis and increasing gas in place in coal bed methane reservoirs. However, important questions remain about how laboratory results relate to what may occur in the reservoir. This paper presents the results from a series of core floods conducted at reservoir pressure and temperature on intact coal core samples. Nutrient consumption is characterised by measuring the nutrient balance between inflow and outflow waters. Gas content is measured through a helium flood at the end of the experiment during which the pore pressure is dropped to atmospheric pressure to drive off any adsorbed gas. These experiments confirm that gas generation does occur and at high enough rates to rapidly increase gas content.