

QUANTIFYING GAS CONTENT IN COALS USING BOREHOLE MAGNETIC RESONANCE

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Evaluating gas content in coals has significant commercial and operational importance. In coal seam gas exploration and development, gas contained in coal seams is the resource of interest. In coal mining, quantifying gas content and evaluating the effectiveness of degassing is essential to safe mining operations.

Traditional approaches to saturation evaluation in conventional oil and gas reservoirs rely on relationships between resistivity and water saturation. These relationships are challenging to apply in coals due to complexities in their pore systems and gas trapping mechanisms. Therefore, geophysical log-based methods are not commonly employed for saturation evaluation, and core canister desorption measurements are the standard approach for gas content evaluation. Desorption measurements present their own challenge due to the unknown and variable volume of gas lost during core recovery, so an in-situ measurement of gas content is desirable.

Advanced magnetic resonance measurements are one method of resistivity-independent saturation evaluation that have been employed in the oil and gas industry for the past approximately fifteen years. However, previous approaches to these types of measurements have focused on the evaluation of conventional reservoirs and hence free gas and oil volumes, and have lacked sensitivity to adsorbed gas, which has a different magnetic resonance response. A novel magnetic resonance acquisition scheme has been developed that provides sensitivity to both adsorbed and free gas, as well as water, allowing for the complete evaluation of fluid content in coal seams. This measurement has been employed in evaluating coal gas content for mining optimization with encouraging results.