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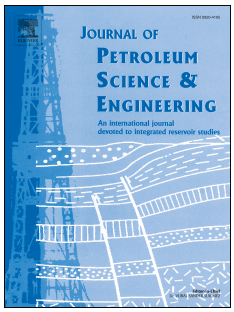

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Mineralogical variability of the Permian Roseneath and Murteree Shales from the Cooper Basin, Australia: Implications for shale properties and hydrocarbon extraction

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Abstract

Brittleness and plasticity indices in hydrocarbon reservoirs are calculated to understand how rocks behave under stress, and for assessing the fracturing performance of clay-rich shale reservoirs and assessing borehole stability. Evaluating shale plasticity/brittleness requires careful analysis of clay mineral composition in target shales and the development of fracking strategies for optimal shale stimulation. Here we report on the mineralogical variability of two Permian lacustrine shale units, the Roseneath and Murteree shales in the Cooper Basin, Australia, that are considered to have potential as unconventional hydrocarbon producers. The study involved a combination of X-ray diffraction, scanning electron microscopy and petrophysical modelling of the Roseneath and Murteree shales in order to obtain a better understanding of the compositions and microfabrics of these two units. This is part of a larger investigation of the shale gas potential of these two units in the Cooper Basin, and the results presented here may ultimately lead to improved reservoir stimulation techniques in both units. Core data has been integrated with wireline logging data to better identify brittle and plastic zones within the Roseneath and Murteree shales. Mineralogical analysis shows that both units are composed mainly of detrital quartz and clay/mica minerals with siderite cement. The clay mineral composition is dominated by illite/mica, and kaolinite in both units. However, based on the relative mineralogical differences between the two units, the Murteree Shale has more favourable brittle properties than the Roseneath Shale, and is considered to be more amenable to hydraulic fracturing for