Clay mineralogy in subsurface sandstones of Malaysia and the effects on petrophysical properties

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Clay minerals are common constituents of the subsurface sandstones in Malaysian sedimentary basins. Kaolinite, illite, mixed-layer illite/smectite, chlorite, and smectite have all been identified.

To date, petrophysical analyses of sandstone formations in the various basins indicate that clay content is the most prevalent control of porosity and permeability. Not only is the total amount of clay important but also the mineralogy, distribution, and morphology.

For reserves estimation, the ability to determine from wireline logs the total clay content in hydrocarbon-bearing reservoirs is very important. This ability often relies on the (sometimes erroneous) assumptions that the surrounding shales comprise clay only and that the sandstone formations contain clays of similar mineralogy and morphology to the surrounding shales.

Our investigations indicate significant variation of clay mineralogy occurs, not only between basins but also within individual basins and within individual wells. This leads to significant variation of porosity, permeability, and wireline log response and demonstrates the need for a systematic study of clays during the exploration and development phases of a field.

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