
Diagenesis and porosity reduction during burial of upper Miocene sandstones, Jerneh-3 well, Malay Basin

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The average porosity of reservoir sandstones in the Jerneh-3 well, central Malay Basin, decreases with increasing depth, from 31% at 1,270 m to 23% at 1,940 m. Because all the sandstones are fine grained, well to moderately sorted, and mineralogically similar, the observed loss of porosity has been interpreted to be due to burial diagenesis.

Petrographic studies indicate that the reduction in porosity is mainly the result of mechanical compaction during burial down to about 1,200 m, followed by the precipitation of authigenic quartz and kaolinite at greater depths. Cementation was influenced by diagenetic reactions which may have occurred simultaneously within the adjacent shales, namely: (1) the transformation of smectite to illite, and (2) the maturation of kerogen. The silica which formed the authigenic quartz was partly derived from smectite transformation in the adjacent shales, while CO₂ released by maturing kerogen resulted in acidic pore waters which dissolve detrital K-feldspar in the sandstones and precipitate authigenic quartz and kaolinite. Dissolved K-feldspar also provided silica for quartz cementation.

The diagenetic features in the Jerneh-3 sandstones are comparable to those reported from sandstones in the neighbouring Pattani Basin which may have had a similar burial history.