
Characterisation of early diagenetic cementation in the Natih Formation, Oman, and it's impact on reservoir sweep

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The Albian- Cenomanian Natih Formation is a key reservoir in Oman. It was deposited on a shallow water carbonate platform, and is dominated by inner and mid ramp skeletal wackestones and packstones that are intercalated. Towards the top of upward shallowing cycles, laterally discontinuous layers of rudist grainstone form thin layers of high permeability contrast.

Much of the reservoir succession is dominated by apparently monotonous successions of biotubated packstone and wackestone. Microcrystalline marine calcite cements have pervasively overprinted these bioturbation fabrics, resulting in a 'pseudo-nodular' fabric. In general, the Thalassinoides-dominated burrow network is cemented, and is surrounded by a leached halo with an adjacent compacted, and occasionally dolomitised, host matrix. The pre-compactional texture and isotopic data are consistent with cementation from marine fluids, probably immediately below the sediment-water interface. There is some variability in the type of bioturbation, and consequently in the distribution of cements, as well as in the degree of compaction and leaching.

Differential cementation of the bioturbated fabric results in a centimetre-scale heterogeneity. This can be characterised by a number of rock types that differentiate variability in flow properties and saturation profile. With ongoing efforts to improve recovery from fields producing from the Natih Formation, it is necessary to understand the fine scale variability in rock properties associated with pseudo-nodular cementation. In particular the correct representation of the saturation, absolute and relative permeability of the fabrics within reservoir models is key to targeting bypassed oil. This is a major challenge, which requires recourse to detailed experimental techniques and simulations, as well as careful upscaling, before more conventional modeling approaches are adopted.
