Preservation of Methane in Deep, Hot Reservoir Rocks

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ABSTRACT

How deep can we drill and still find giant methane fields? Greatly simplified diagrams appeared decades ago that attempted to explain the origin of oil versus gas simply in terms of kerogen type and thermal maturity. This thinking is now obsolete. It is vital to better predict the maximum stability field of methane if deep drilling and shale-gas exploration are to be more successful.

Some reservoirs, especially carbonates, contain highly reactive sulfate minerals, which result in thermochemical oxidation of methane to carbon dioxide and other corrosive gases. Clays and zeolites are catalysts that promote early destruction of methane in fractured black shales. Pyrolysis Tmax is generally misinterpreted in shale exploration. In contrast, reservoirs of pure quartz sandstone (and sometimes coal) are the most non-reactive.

Over half of the prospective volume of the gulf shelf sediment section may be untouched by exploration. We need to understand the catalytic properties of common reservoir minerals and their effects on the stability of methane. Given dense-packing of liquid methane at depth, how many giant gas fields are still waiting to be found in the greater gulf area? There are reasons to be optimistic.

Sassen, R., 2010, Preservation of methane in deep, hot reservoir rocks: Gulf Coast Association of Geological Societies Transactions, v. 60, p. 831.