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The Depositional Heterogeneity of the Organic-Rich Deposits of Oxfordian Age in Kuwait

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SUMMARY

Najmah Shale in Kuwait of Oxfordian age has become an important source of hydrocarbons. It is an excellent source rock (organic rich carbonates, misnamed shales). In the southern part of the basin, these “shales” are interbedded with turbidites and grain flow deposits. Despite the renewed interest in the geology of organic rich sediments, several practical problems render the study of this formation a challenging one. The advancement of technology & knowledge converged to transform this formation into a producing reservoir. Our aim is to characterize these different lithologies and to orient the exploration strategy in accordance with the new concepts.

Shale Characteristics

Our intent here is to compare the shales of Kuwait with the vast experience in North America. Factors, like price and technology (hydraulic fracturing and horizontal drilling) converged to kick off the last boom. The properties like brittleness, Organic Matter content, Thermal Maturity, presence of significant “organo-porosity” within kerogen are key factors controlling gas flow rate. The so-called bituminous shales formed during transgressive Oceanic Anoxic Events. Petrographic studies reveal detrital and authigenic mineralogy, the texture, and the controls on reservoir quality. Organic matter, forms most of rocks. Hydrocarbons are present & fill the pores. Matrix is compacted faecal pellets. Detrital clay is present as illite & kaolinite. Authigenic mineralogy: calcite is present at all forms of cements. Dolomite and Pyrite are present in small amounts. The rock, slightly broken relieves quantities of gas attesting the tiny pores in organic matter. Fissility and Laminae: some splitting is helped by the presence of bivalve shells & drilling process. Permeability: negligible under reservoir conditions will be enhanced by fracturing. The turbidites & the grain flows possess all the characteristics of calciclastics, except very rich in organic matter.

Conclusions

Gas shale meets the definition of the North American "gas shale" in that it contains enough organic material. The carbonate minerals account for most of the composition of the rock placing it in the limestone group. Conducting geochemical tests & mapping the thermal maturity of the formation is one of key elements of success. The maturity seems to relate directly to the gas to oil ratio, one of the key factors controlling gas flow rates. The studies regarding the intricate nature of shale, from nano- to macro-scale are questioning the meaning of the term “shale”. The nature of rocks decide the nature of trapping mechanism, hence the exploration strategy.