

The Origin and The Prospectivity of Najmah Shale in Kuwait

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Summary: The Najmah shale in Kuwait is an example of revealing the complexity of geological properties of the gas shales. The factors controlling the gas flow rate (organic matter content, thermal maturity, organo-porosity etc...) compared with the vast experience in America helped to classify this formation as a prospective one for shale gas all over Kuwait.

Introduction: Shale gas has become an important source of natural gas. Despite the renewed interest in the geology of shale, several practical problems render the study of shales a challenging one. The studies regarding the intricate nature of shale, from nano- to macro-scale are questioning the meaning of the term "shale" & lagging behind. Najmah shale in Kuwait is an example of revealing the complexity of these sedimentological properties.

Theory and/or Method: The core description of thousands of feet and microfacies analysis of more than 500 thin sections of core samples, geochemical analysis from many wells provides an independent insight into the sedimentological, geochemical composition and environmental history of deposition of the formation. The thin sections document the detrital and authigenic mineralogy, the texture and the controls on reservoir quality. The recorded sedimentological data (core-facies, microfacies and textural data) together with geochemical and SEM Data provide an invaluable technique for determination of intricate geological, physical and mechanical properties and recognition of true nature of the shale.

Examples: 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.

Conclusions: Najma 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.

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