

The Shale Spectrum: Potential for interdisciplinary shared understanding among oil shale, oil-bearing shale and gas shale plays

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Production of shale oil from oil shale requires artificial heating of immature kerogen, either at the surface or in situ. Production of shale-hosted oil from oil-bearing shale and shale gas from gas shale depends upon much more traditional methods, although applied in much more complex ways to kerogen that ranges from incipiently mature to overmature. However, the rocks themselves are strikingly similar, even in their compositional and textural diversity. All are very tight, impermeable mudstone (and siltstone), and production of the hydrocarbons, whether natural or synthetic, depends upon fracturing the rock to drain the products. There are, therefore many ways in which understanding of the properties of the broad class of rocks informally called shale can be complementary. Rock properties measured across a range of temperatures and pressures are needed to describe mechanisms of generation, migration and trapping of oil and gas, and to understand the fracturing behavior of the rock for field development. Understanding the kinetics of generation requires experiments at temperatures in the range of in situ retorts, so that these experiments are important to understanding both synthetic and natural systems. Behavior of shale depends not only on its organic content, but also on its mineralogic composition and the variability of that composition. These properties in turn result from the history of the sedimentary rocks, the depositional environments under which they formed, and the diagenetic alteration that followed their deposition. We have developed three separate research consortia on shale systems. Common ground for each of these consortia include:

- 1) characterization of sedimentologic and petrologic features to create an integrated geologic framework
- 2) measurement of critical properties relating to seismic characterization, rock strength and fracturing behavior
- 3) modeling of rock mechanical behavior under stress

Understanding shale systems generically can provide synergistic insights across plays.