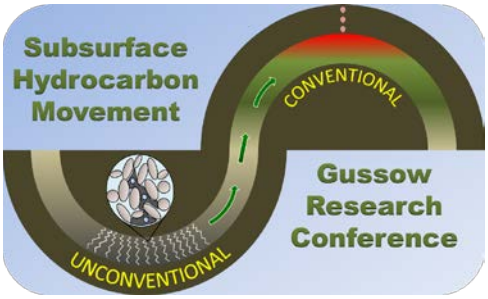

A New Thermal Extraction Protocol to Evaluate Liquid Rich Unconventional Oil in Place and In-situ Fluid Chemistry

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Summary

Assessing oil in place and the proportion of oil that is producible are two critical measurements in evaluating liquid rich unconventional well and play economics. Current methodologies to evaluate *Oil-In-Place* (OIP) include log calculated estimates, petroleum systems charge modeling, and direct geochemical measurements.

The standard open system programmed pyrolysis method has been modified to remove a broader range of thermally extracted free and adsorbed hydrocarbons and non-hydrocarbons in liquid rich unconventional plays. The added isotherms with a relatively low temperature start results in additional free hydrocarbon S1 peaks. The extra S1 peaks are used to assist in evaluating in-situ hydrocarbon quality. Examination of as received and post solvent extracted programmed pyrolysis data from replicate samples indicates a significant amount of solvent extractable free hydrocarbon is not captured in the S1 and rolls over into the S2 peak. This observation suggests the S1 peak may not represent total oil in place less evaporative losses.

This talk will examine a new multi-step high resolution on-column thermal extraction system to provide an inexpensive screening tool to map zones of higher in place oil and evaluate chemical characteristics which can be used to assist in estimating productivity. The thermal extraction unit is coupled to a flame ionization detector (FID) by a short uncoated capillary column to generate a high resolution thermal extraction profile (thermogram) with four temperature fractions. The area under each thermal peak provides direct measurements of volatized hydrocarbon and non-hydrocarbon compounds. Examination of individual compounds within each thermal fraction demonstrates multi-step thermal extraction is not a simple fractional distillation but also is impacted by inorganic and organic interactions. If we assume each thermal fraction represents oil compounds with increased complexity, then one can use peak area ratios to estimate in-situ fluid make-up and the proportion of in-situ oil that can be considered producible with completions enhancement.