An Oil-Source Rock Correlation Examining the Potential of the Chattanooga Shale as a Source Rock for Oil within the Spivey-Grabs-Basil Field, Kingman and Harper Counties, Kansas*

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Abstract

The Spivey-Grabs-Basil oil field, located in south-central Kansas, is one of the most productive fields in the state. Compartmentalization in this relatively small geographic area provides an opportunity for experimentation in a more controlled setting than other areas of the mid-continent, and is the reason why this field was chosen for an oil source rock correlation. This research is formatted to attempt to begin to answer the question: is the oil in Kansas being locally sourced, or is it migrating north from the Anadarko Basin?

An oil source rock correlation is loosely defined as a study that can offer either a positive or negative correlation between oils and potential source rocks using organic biomarkers. While traditional methods are being used in this research, additional methods using inorganic biomarkers are being attempted as well in an attempt to extend and verify the pre-established methods. This research compares source rock results to oil analysis previously completed by Evans et al, 2011. Methods used for source rock analysis include Gas Chromatography and Mass Spectrometry (GCMS), and Pyrolysis.
ABSTRACT

The Spivey-Grabs-Basil oil field, located in south-central Kansas, is one of the most productive fields in the state. compartmentalization in this relatively small geographic area provides an opportunity for experimentation in a more controlled setting than other areas of the mid-continent, and is the reason why this field was chosen for an oil source rock correlation. This research is formatted to attempt to begin to answer the question: is the oil in Kansas being locally sourced, or is it migrating north from the Anadarko Basin (as shown in Figure 1)?

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METHODS

SAMPLE SELECTION

1. The KGS website was used to search our well-logs that penetrated the Chattanooga shale.
2. Gamma-ray logs were used to correlate appropriate depths with well-cuttings, as well as to verify profile similarity to the Woodford shale in the Anadarko Basin.
3. Cuttings were picked up from the KGS library in Wichita, KS, and shale selected from cuttings and crushed for TOC and GCMS testing.

TOC was completed on individual samples to test their viability as a possible source rock.

TOTAL ORGANIC CARBON (TOC) => GAS CHROMATOGRAPHY AND MASS SPECTROMETRY (GCMS)

TOC was run on individual samples to test their viability as a possible source rock. GCMS was run, once viability was ascertained, to compare the biomarkers from the Chattanooga shale to the oil being produced in the Spivey-Grabs-Basil.

SAMPLE SELECTION

REGIONAL TOC COMPARISON

A comparison of multiple TOC studies, against rock cuttings found in the Spivey-Grabs-Basil, have been combined in chart form and indicate that the TOC values in this field are well within reasonable parameters to further examine the underlying Chattanooga shale for source rock potential.

CONCLUSIONS & RECOMMENDATIONS

- The biomarker comparisons are conclusive that most, if not all of the oil in the Spivey-Grabs-Basil is genetically the same or very similar to the Chattanooga shale which underlies it.
- The combined results from this study, and others like it, show no reason why Kansas would not be capable of generating its own oil based on the organic potential of source rocks.
- In order to further substantiate the results found here, I recommend:
  - A biomarker study comparing the Woodford shale to the Chattanooga preferably in north-central Oklahoma, and then increasing further away.
  - Additional oil-source rock correlations within the state of Kansas, particularly in units with higher TOC values. Units with core sample would prove to be more exact.
  - Oil to oil correlations across Kansas, especially in fields with compartmentalization. An investigation in biomarkers and biomarker maturity might prove surprising, as they did in Evans (2011).
  - The potential of the Chattanooga shale as an unconventional resource should be explored.