

Geolsochem Corporation Project Proposal

Natural Gas Petroleum Systems of Gulf of Mexico: *Source Rock Specific Gas Isotope Fractionations*

Introduction

Understanding and applying knowledge of carbon isotopic signatures of gases, both in oil and gas reservoirs, improve evaluation of reservoirs prior to either testing or completion operations. Differences in carbon isotopic values result from differences in generation temperatures depending on source rock type and organofacies. In addition fractionation of gas, gas mixing, and oil-to-gas cracking complicate accurate application of carbon isotopic results to stacked reservoirs in the Gulf of Mexico (GOM). The availability of immature source rocks from the Jurassic, Cretaceous, and Tertiary provide organic matter on which detailed carbon isotopic analysis can be completed and these results will aid the accurate understanding of these data in the GOM.

There are several key issues in assessing GOM leases and prospects: (1) the likelihood of hydrocarbon charge and amounts, (2) primary oil quality and processes that affect its quality secondarily, (3) the occurrence of tar mats that may result from different physico-chemical phenomena, (4) natural gas petroleum system (origin, maturity)

Study Proposal

The proposed study on source rocks and oils from the GOM will include the following:

1. Isotopic calibration of primary gases derived from immature Tertiary, Cretaceous and Jurassic source rocks from Norton - Garden Banks 754 #1, and Showboat - Atwater Valley 336 and Tertiary samples taken from DSDP cores.
2. Isotopic calibration of gases from cracking of a carbonate and shale sourced oils.
3. Oil and Gas Generation from Kerogen – Kinetics for C1, C2, C3-C5, C6-14, C15+
4. Oil Cracking Kinetics – GOR prediction,

Deliverables

Based on laboratory experiments conducted at GeolsoChem on 6 source rocks and 2 oil samples, as well as computational modeling, data will be provided that will enhance participants ability to:

- Determine amount of gas formed from each source rock system at different maturity
- Provide oil and gas generation results for input into participants basin models.
- The model will including following components:
 - Gases: C₁-C₅
 - Light oil: C₆-C₁₄
 - Heavy oil: C₁₅+
- calibration of heat flow histories
- correlation of gases in an exploration area to their source
- assessment of mixed or multiple sourcing of hydrocarbons
- determination of the thermal maturity of the source
- timing of hydrocarbon generation
- based on the geological heating rate, estimate the geological age(s) of gas formation
- determination of gases formed from oil cracking

Participants will be able to use these data in context with geological data to evaluate lease block opportunities and currently held leases to:

- identify oil and gas windows
- predict gas maturity
- gas formation temperature
- origin of natural gas system
- hydrogen carbon generation potential
- oil thermal deadline prediction
- map gas migration pathways
- assess factors affecting oil quality such as emplacement of secondary gas charge, mixing
- assess the likelihood of encountered tar mats
- assess reservoir continuity and production allocation issues

With the added possibility of determining gas isotopic data during drilling or in time for completion, such calibration would reduce exploration and production testing. This provides a means to assess all stacked reservoir intervals without expensive testing or inference from limited data sets.

Project Execution

Source rock analysis will be completed on 6 samples – 2 Jurassic, 3 Cretaceous, and 1 Tertiary – at GeolsoChem. These results will be modeled using a new kinetics model developed by Yongchun Tang at GeolsoChem and data will be provided to each participant in raw and calibrated forms. Results will be delivered as available via internet reports.

Phase I: The results for 3 immature source samples – 1 each from the Jurassic, Cretaceous and Tertiary will be provided in the 1st and 2nd quarters 2009.

Phase II: The results for 3 additional source rock samples and 1 carbonate and 1 shale –sourced oil samples will be provided in the 3rd and 4thquarters 2009.

Cost

Each phase costs \$50,000.00 per participant; however, participation may be for Phase I only at \$50,000.00 or for both Phases I and II at \$100,000 (**\$65,000 for phase 2 if subscribed to after July 1, 2009**). An initial payment of 50% of the total is required with execution of the participation agreement

Participation

Participation requires execution of a license agreement whereby the terms and conditions of the study are detailed.