



dig
Dolan Integration Group

Geochemistry for Energy

2520 55th St, Suite 101
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p: 303.531.2030

Hydrocarbon Gas Composition and Stable Isotopes Data and Interpretation

Job #: 16090705
Lab #: DIG-009711
Client: COGCC
Sample Name(s): AFB L-01

Analytical Report



Job #: 16090705
 Lab #: DIG-009711
 Client: COGCC
 Sample Name: AFB L-01
 Date Sampled: 09/21/16
 Time Sampled: 10:10
 Sample Description: Water
 Sampling Notes:
 Date Received: 09/21/16
 Date Analyzed: Gas Composition: 9/22/16
 Date Reported: 10/25/16
 Comments: Headspace created with UHP Helium

Measured Values:	Measured ppm	Analyte mol % ^a	HC mol %	$\delta^{13}\text{C}$ ‰ VPDB	δD ‰ VSMOW	Comments
Nitrogen (N ₂)	600627	76.17	-	-	-	
Oxygen + Argon (O ₂ +Ar)	183880	23.32	-	-	-	
Carbon Dioxide (CO ₂)	4016	0.51	-	-	-	
Helium (He) ^b	na	na	-	-	-	Added Headspace
Hydrogen (H ₂)	nd	nd	-	-	-	
Methane (CH ₄)	54	0.01	100.00	na	na	
Ethane (C ₂ H ₆)	nd	nd	nd	nd	-	
Propane (C ₃ H ₈)	nd	nd	nd	nd	-	
iso-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
n-Butane (C ₄ H ₁₀)	nd	nd	nd	nd	-	
iso-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
n-Pentane (C ₅ H ₁₂)	nd	nd	nd	nd	-	
Hexanes + (C ₆ H ₁₄)	nd	nd	nd	nd	-	

Calculated Values:	
Total HCs (ppm)	54
Gas Wetness (mol % C ₂ +C ₁ +))	0.00
C ₁ /(C ₂ +C ₃) (mol/mol)	#DIV/0!

^a Analyte concentrations normalized to 100% (Mol. % is approximately equal to Vol. %)

^b Addition of helium negates the ability to detect native helium and may negate the ability to detect hydrogen.

HC= Hydrocarbons

nd = not detected

na = not analyzed

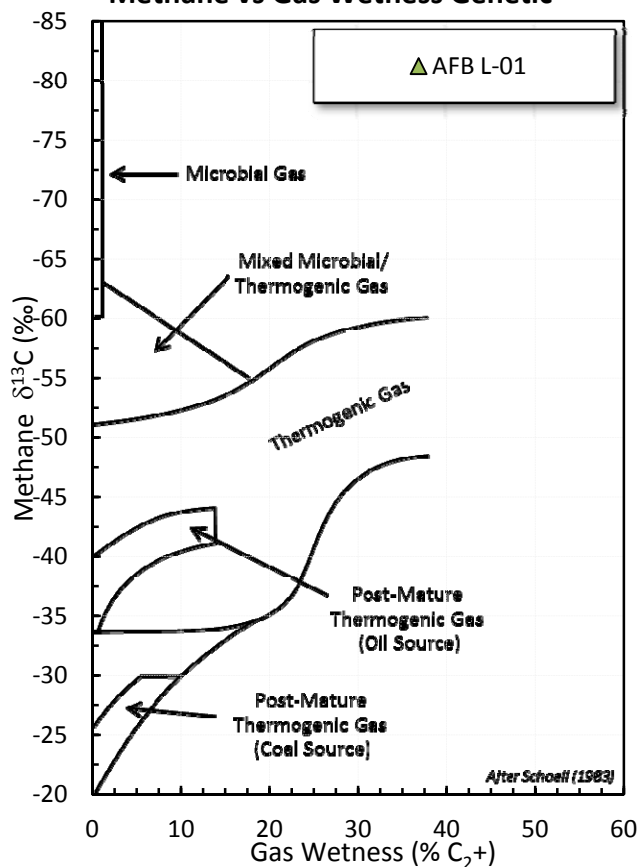
Stable isotope results based on multi-point laboratory calibration

Error $\delta^{13}\text{C}$ < 0.5 ‰

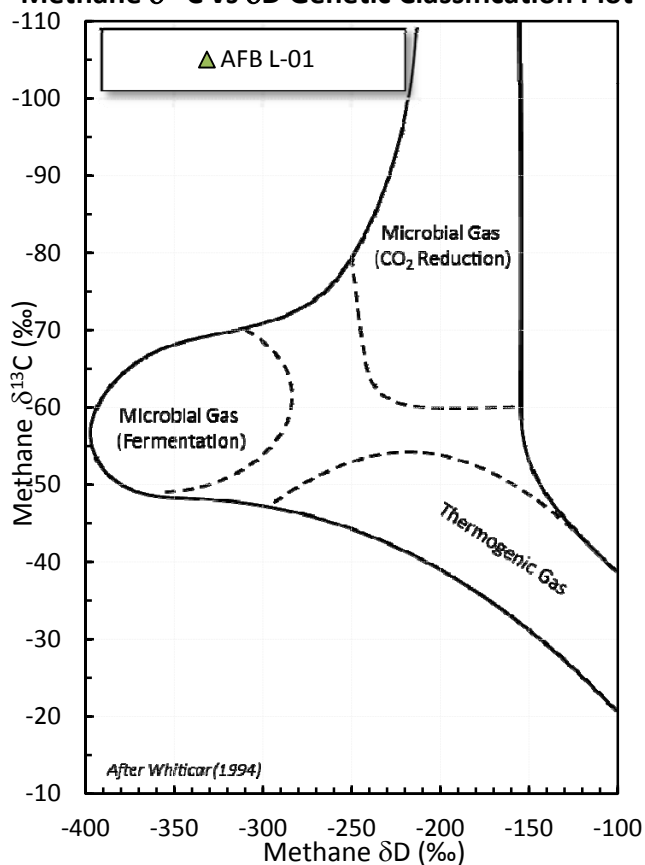
Error δD < 5.0 ‰

Stable Isotope Interpretive Plots

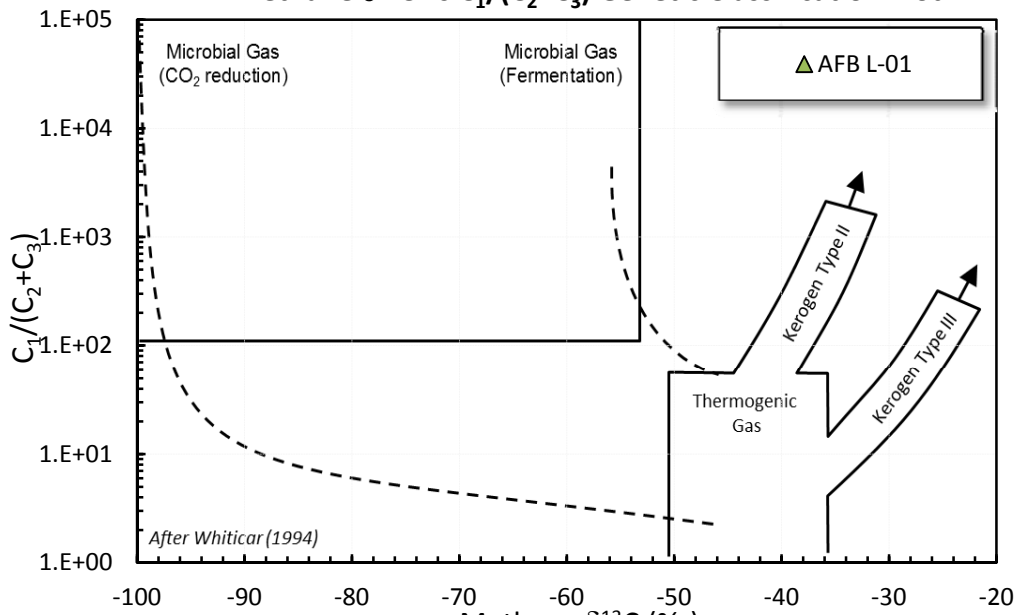
Methane vs Gas Wetness Genetic



Methane $\delta^{13}\text{C}$ vs δD Genetic Classification Plot



Methane $\delta^{13}\text{C}$ vs $\text{C}_1/(\text{C}_2+\text{C}_3)$ Genetic Classification Plot



Chain of Custody Form



dig
Dolan Integration Group

Geochemistry for Energy

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Job 16090705
DIG - 309710
DIG - 309713
DIG - 309716

Send Data and Invoice to:

Name: Rick Allison
Company: COGCC
Address: 1120 Lincoln Street, #801
Denver, CO. 80203
Phone: 970-461-2970
Fax: _____
Email: rick.allison@state.co.us

AFE #: _____
Report Ctr: _____
Project: 076 Upper Pierre WQ
PO #: CT2017-734
Location: 11694301
Sampled By: SAF

Sample Description

Sample Description

				Analysis Requested						Comments
Container #	Sample Identification	Date Sampled	Time	Gas Composition* N ₂ , O ₂ , CO ₂ , He, H ₂ , C ₁ -C ₄	RSK-175* (gas composition) N ₂ , O ₂ , CO ₂ , He, H ₂ , C ₁ -C ₄ with dissolved Cl ₂ , Cl ⁻ & C ₃	δ ¹³ C Methane (Carbon)	δD Methane (Hydrogen)	δ ¹³ C Ethane-Pentane (C ₂ -C ₅ if present)		
	AEB N-01 ↓	9/20/16 ↓	1145 ↓	✓		✓	✓			Stable Isotopes of Water
										dC13 of Dissolved Inorganic Carbon

Chain-of-Custody Record

Signature	Company	Date	Time
Relinquished by <u>[Signature]</u>	Pinyon	9/21/16	0800
Received by <u>[Signature]</u>	DIG	9/21/16	1300
Relinquished by			
Received by			

*Gas composition vs RSK-175- Gas composition is a basic analysis of the concentration (ppm) of gases within the headspace of the sample (headspace is created at the lab). RSK-175 is a specific analysis technique combined with calculations to give the total dissolved gas of each species in the water sample (mg/L).

Why one or the other? Gas composition gives us a quick, general look at relative concentrations and ratios (e.g., gas wetness). RSK-175 gives us an exact total of gas present in the sample (headspace and dissolved in the water). Questions? Give us a call at 303-531-2030