

**Petroleum Geochemistry Data Report
– 3 Gas samples from NOCS Well
31/4-11**



**Applied Petroleum Technology AS
P. O. Box 123
2027 Kjeller
Norway**

Volume 1 of 1 .



Report Title:

Petroleum Geochemistry Data Report – 3 Gas samples from NOCS Well 31/4-11.

Client: Norsk Hydro ASA

Report Number: APT00-027

**Clients Reference: A Steen
Bestilling 5074656**

Classification: Confidential

**Distribution:
Norsk Hydro (3)
APT (2)**

Date: 19th December 2000

1 Introduction

3 gas samples from well 31/4-11 are analysed for gas and isotopic composition.

On the samples C₁ - C₅ and CO₂ are quantified. The $\delta^{13}\text{C}$ value is measured on methane, ethane, propane, the butanes and CO₂, and the $\delta^{18}\text{O}$ value is measured on CO₂. In addition the δD value is measured on methane. Duplicate analysis on $\delta^{13}\text{C}$ is run on some components of sample 3.

2 Analytical procedures

Aliquots of 0.2 ml are sampled with a syringe for analysis on a Porabond Q column connected with flame ionisation (FID) and thermal conductivity (TCD) detectors. The detection limit for the hydrocarbon gas components is 0.001 $\mu\text{l/ml}$, for CO₂ 0.05 $\mu\text{l/ml}$.

For the isotope analysis 5-10 ml of the gas is sampled with a syringe and then separated into the different gas components by a Carlo Erba 4200 gas chromatograph. The hydrocarbon gas components are oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products CO₂ and H₂O are frozen into collection vessels and separated.

The combustion water is reduced with zinc metal in sealed quartz tubes to prepare hydrogen for isotopic analysis. The isotopic measurements are performed on a Finnigan MAT 251 and a Finnigan Delta mass spectrometer.

IFEs value on NBS 22 is $-29.77 \pm .06 \text{‰ PDB}$.

The analytical procedures are tested with a laboratory gas standard mixture. Based on repeated analysis of the gas standard, the reproducibility in the $\delta^{13}\text{C}$ value is better than 0.5 ‰ PDB for all components. The reproducibility in the δD value is likewise better than 10 ‰.

3 Results

The normalised volume composition of the gas samples is shown in Table 1. The stable isotope composition is shown in Table 2.

The molecular composition related to the carbon isotope variations in methane from the sample are plotted in Figure 1 (Schoell, 1983), the carbon and hydrogen variations in methane are plotted in Figure 2 (Schoell, 1983) and the carbon isotope variation in ethane related to the carbon isotope variations in methane in Figure 3 (Schoell, 1983).

Table 1 Volume composition of a gas sample (normalised values) from well 31/4-11

Sample	Well	IFE no GEO	C ₁ %	C ₂ %	C ₃ %	iC ₄ %	nC ₄ %	iC ₅ %	nC ₅ %	CO ₂ %	ΣC ₁ -C ₅ %	Wet- ness	iC ₄ / nC ₄
1	31/4-11	20002330	64,8	11,4	11,3	2,5	5,3	1,9	2,1	0,7	99,3	0,35	0,48
2	31/4-11	20002331	69,1	11,2	10,5	2,2	4,2	1,2	1,1	0,6	99,4	0,31	0,52
3	31/4-11	20002332	64,6	12,9	10,6	2,0	4,9	1,8	2,2	1,0	99,0	0,35	0,41

Table 2 Isotopic composition of a gas sample from well 31/4-11

Sample	Well	IFE no GEO	C ₁ δ ¹³ C ‰ PDB	C ₁ δD ‰ SMOW	C ₂ δ ¹³ C ‰ PDB	C ₃ δ ¹³ C ‰ PDB	iC ₄ δ ¹³ C ‰ PDB	nC ₄ δ ¹³ C ‰ PDB	CO ₂ δ ¹³ C ‰ PDB	CO ₂ δ ¹⁸ O ‰ PDB
1	31/4-11	20002330	-45,9	-207	-30,3	-28,5	-28,2	-28,1	-17,0	-9,7
2	31/4-11	20002331	-45,9	-211	-30,3	-28,7	-28,6	-28,0	-18,3	-8,8
3	31/4-11	20002332	-45,4	-214	-30,5	-28,2	-26,9		-15,9	-9,2
							-27,1	-28,4	-17,3	-11,5

4 Literature

Schoell, M. (1983). Genetic characterisation of natural gases. *The American Association of Petroleum Geologists Bulletin*, 67,2225-2238.