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SUMMARY

The natural gas from well 7120/7-1 has been separated into the gas components, CH_4, C_2H_6, C_3H_8, $i\text{-}C_4H_{10}$, $n\text{-}C_4H_{10}$ and CO_2.

The $\partial^{13}C$-values have been measured for all the gas components. The ∂D-value has also been determined on CH_4.

The results indicate that the gas of this well is formed during late oil generation at a maturation level equivalent to source LOM of 11-12, or vitrinite reflectance of 1.1-1.4.

DISTRIBUTION

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REPORT ON STABLE ISOTOPES, $\partial^{13}C$ AND ∂D, FROM THE NATURAL GAS OF WELL 7120/7-1.

ANALYTICAL PROCEDURE

The natural gas has been separated into the different gas component by a Carlo-Erba 4200 instrument. The hydrocarbon gas components were oxydized in separate CuO-ovens, which enables us to collect several times when the concentration of a gas component is low. The combustion products CO_2 and H_2O were frozen into collection vessles and separated. The isotopic measurements were performed on a Finnigan Mat 251 mass spectrometer. Our $\partial^{13}C$-value on NBS-22 is $-29.77 \pm .06$ °/oo.

RESULTS

The results are given in the following table :

	Methane	Ethane	Propane	i-Butane	n-Butane	CO_2
$\partial^{13}C$ °/oo *	- 39.0	- 27.0	- 24.5	- 22.0	- 23.5	- 5.0

∂D °/oo ** -165 ± 5 °/oo

The ∂^{13}-values for methane, ethane, propane and n-butane have been plotted on the maturation diagram given by James (1983)*** (fig. 1).

* *Our uncertainty on the $\partial^{13}C$-values is estimated to be .3 °/oo and includes all the different analyses steps.*

** *The ∂D-value has in this case been measured at Mook's laboratory, W.G. Mook, Isotope Physics Laboratory, University of Groningen, Netherlands*

*** *James, Alan T. (1983) : Correlation of Natural Gas by Use of Carbon Isotopic Distribution Between Hydrocarbon Components, A.A.P.G. Vol. 67, No. 7, July, 1983.*

A good fit is found for the ethane - propane - n-butane - separations. A source LOM of 11-12 (eq. to a vitrinite reflectance of 1.1 - 1.4 as defined by Tissot and Welte * (1978)) is indicated for the gas. The $\partial^{13}C$-value for methane fall above the methane line in the diagram (fig. 1). This is common at high maturities.

The $\partial^{13}C_{CH_4}$-value and the ∂D_{CH_4}-value have been plotted in Schoell's (1982)** classification scheme for natural gases (fig. 2). This diagram indicates that the gas is associated, and that it is formed at a late maturity stage.

CONCLUSION

The stable isotopes ($\partial^{13}C$ and ∂D-values) indicate that the natural gas of well 7120/7-1 is an associated gas formed during late oil generation at a maturation level equivalent to a source LOM of 11-12 or a vitrinite reflectance of 1.1 - 1.4.

* *Tissot, B.P. & Welte, D.H. (1978): Petroleum Formation and Occurrence, Springer Verlag pp. 538.*

** *Schoell,M. (1982): Application of Isotope Analyses to Petroleum and Natural Gas Research, Spectra September 1982.*

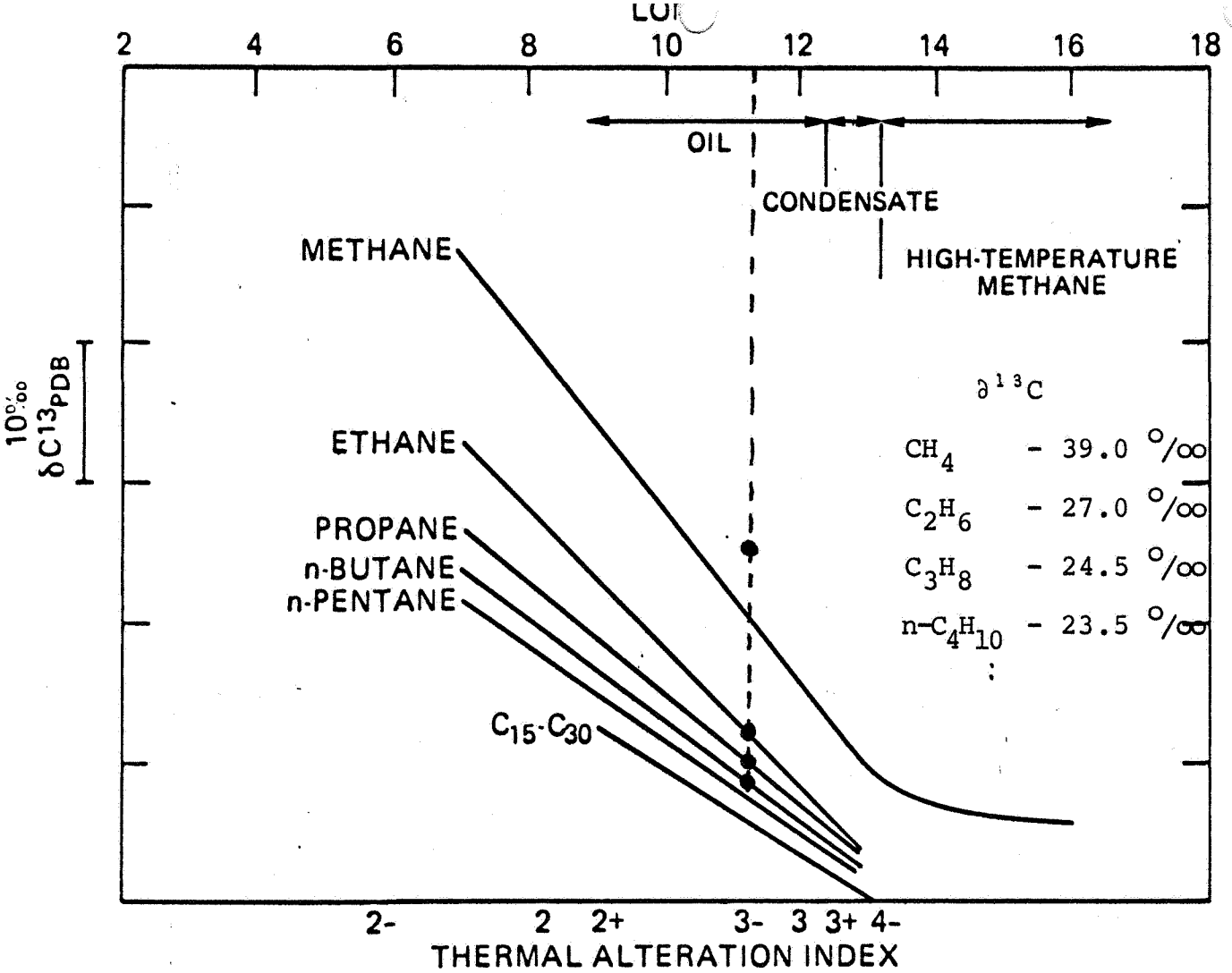

Figure 1. Carbon isotopic separations of 7120/7-1 - gas plotted on the maturity diagram (after James, 1983). A source LOM of 11 - 12 is indicated for the gas.

The calculated carbon isotopic separations between gas component are plotted on the vertical axis using a sliding scale that is simply the algebraic difference, in parts per mil, between the isotopic compositions of the natural gas components. The scale does not possess a fixed origin, but is oriented with the more depleted $\partial^{13}C$ values at the upper end. Use of this sliding scale allows the maturity of a gas to be assessed without prior knowledge of the isotopic composition of the gas's source.

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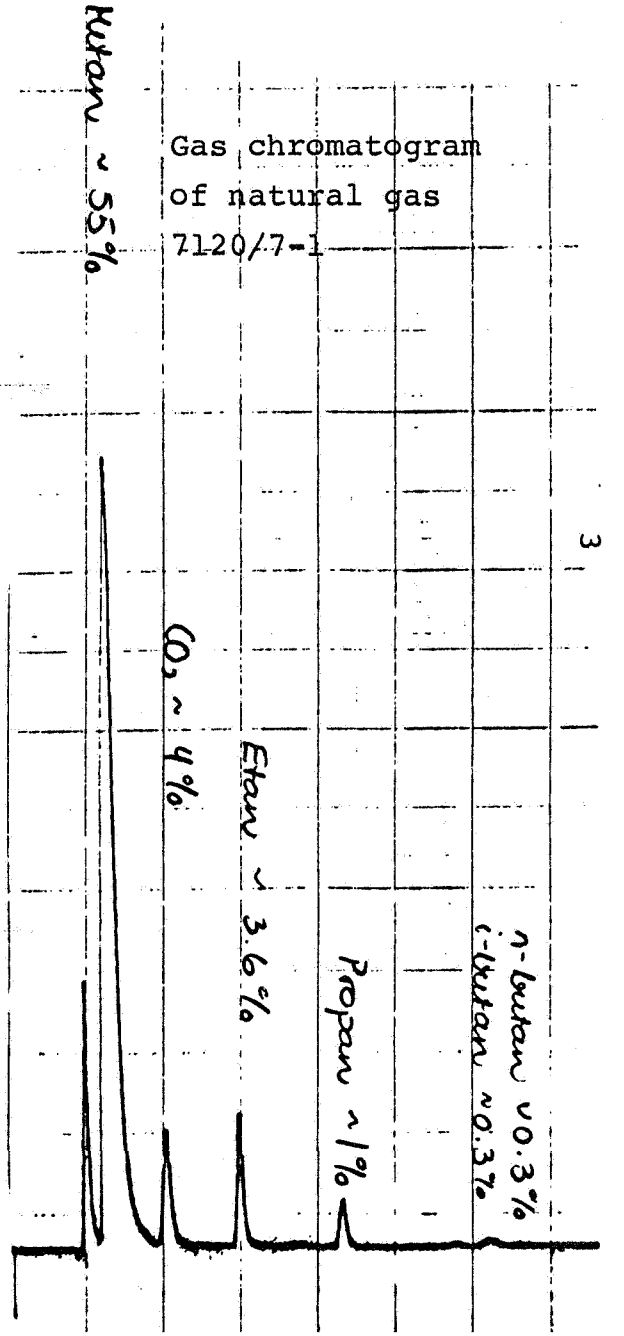

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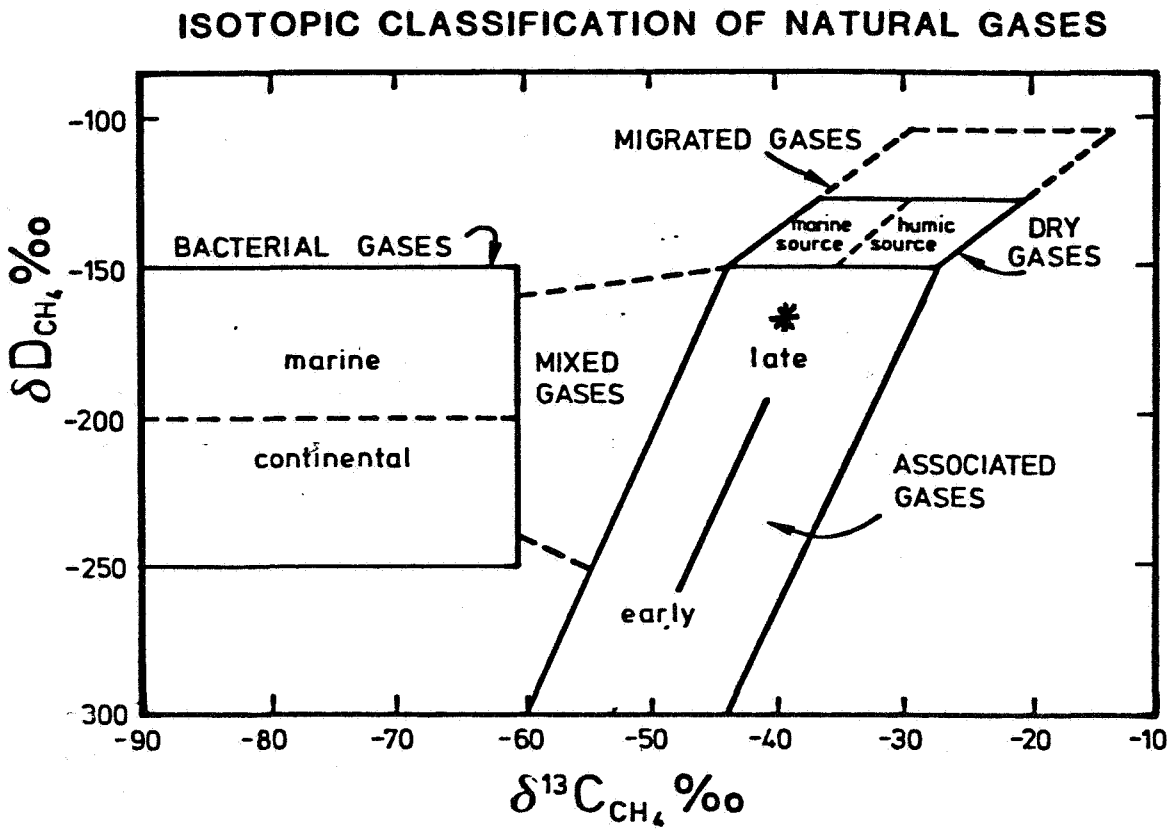

Figure 2. Position of 7120/7-1 gas (*) in Schoell's (1982) classification scheme for natural gases.