Pyromat kinetic model of coal from cuttings (9,220' - 9,260') of the Norton Sound Exxon Corporation OCS Y-0407-1 (Yellow Pup No. 1) well.

See GMC Data Report No. 242

Received 24 June 1995

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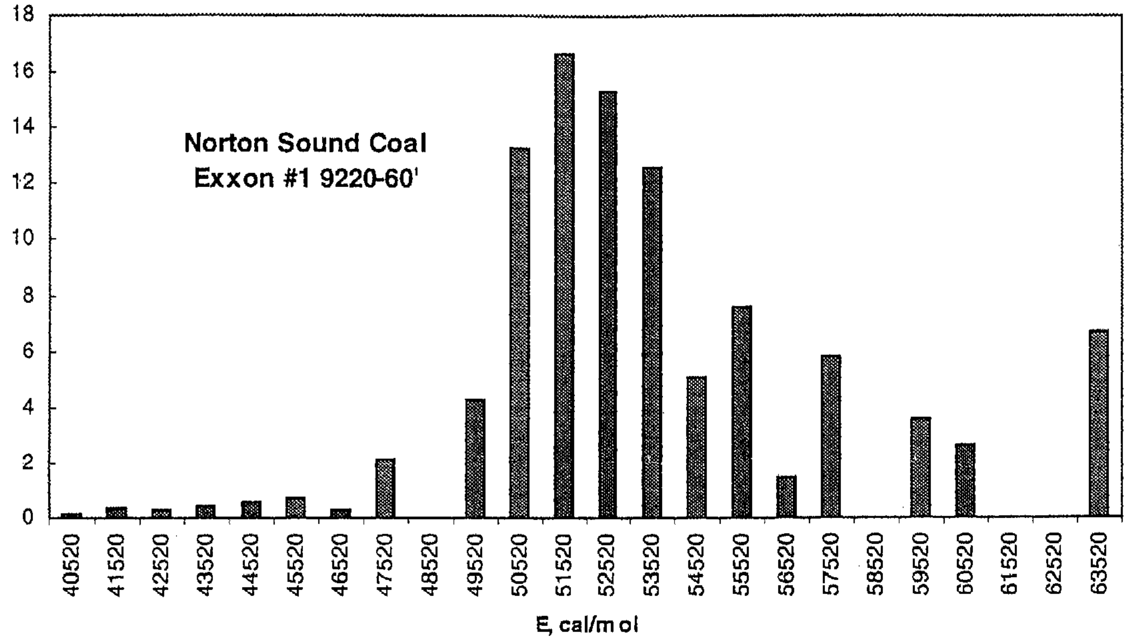
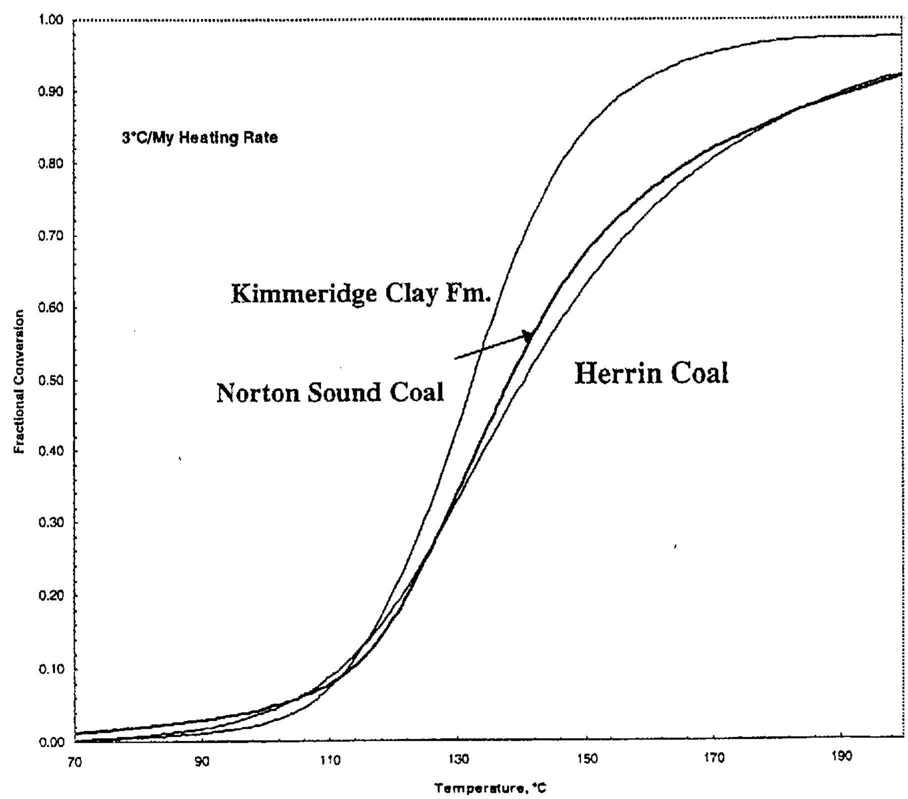
Alaska Geologic Materials Center Data Report No. 245



Corrected Pyromat Kinetic Model
$A = 1 \times 10^{14} s^{-1}$

Fraction	cal/mol
0.13	40520
0.36	41520
0.31	42520
0.42	43520
0.56	44520
0.76	45520
0.26	46520
2.12	47520
0	48520
4.26	49520
13.25	50520
16.64	51520
15.32	52520
12.6	53520
5.12	54520
7.58	55520
1.46	56520
5.82	57520
0	58520
3.63	59520
2.66	60520
0	61520
0	62520
6.73	63520



Mobil Exploration and Producing Technical Center

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Date: May 19, 1995

To: Fred Stone, MEPTEC
George Claypool, MEPTEC

PYROMAT KINETIC MODEL OF COAL FROM NORTON SOUND, EXXON #1 WELL Yellow Pup #1
JOB NO. BGW00A OCS Y-0407

As you requested, I have determined a kerogen decomposition kinetic model for the coal from Norton Sound (Exxon #1, 9220-9260 feet) using the Pyromat II micropyrolyzer. This technique was developed by geochemists at the Lawrence Livermore National Laboratory.[1] Small quantities (10-100 mg) of rock or kerogen are pyrolyzed at different temperature ramp rates (1 to 56°C/min). The pyrograms are then fitted using a program called **KINETICS** resulting in a distribution of activation energies (E, kcal/mol) for either a single predetermined or best-fit frequency factor (A, sec^{-1}).

The kinetic parameters derived from Pyromat experiments are inaccurate for direct use in basin modeling. When compared to field observations, Pyromat kinetics are "too slow" and will result in lower kerogen conversion than measured. In a field study of Maracaibo Basin, Venezuela, LLNL researchers found that the Pyromat activation energies should be shifted downwards by ~2 kcal/mol for the modeled results to agree with the field data.[2,3] This correction is required because of an experimental artifact associated with the inefficient volatilization and transport of the pyrolysates at low temperatures (< 350°C). We have recently calibrated kinetic models derived from Pyromat, hydrous pyrolysis, and MSSV methodology to a set of field test data on the Kimmeridge Clay Formation and have developed a means of correcting the Pyromat kinetic parameters based on the reactivity of the kerogen.[4]

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[1] Braun R.L., Burnham A.K., Reynolds J.G. and Clarkson J.E. (1991) Pyrolysis kinetics for lacustrine and marine source rocks by programmed micropyrolysis. Energy & *Fuels* **5**, 192-204.

[2] Sweeney J., Burnham A., Talukdar S. and Valejos C. (1989) Pyrolysis kinetics applied to prediction of oil generation in the Maracaibo Basin, Venezuela. *Org. Geochem.* **16**, 189-196.

[3] Burnham A.K., Braun R.L., Sweeney J.J., Reynolds J.G., Vallejos G. and Talukdar S. (1992) Kinetic modeling of petroleum formation in the Maracaibo Basin: Final report, Annex XII. US DOE Report No. DOE/BC-92001051, July.

[4] Walters C.C., Claypool G.E., Theis N.K., Acholla F. and Mitchell T.O. (1995) A method to correct Pyromat kinetic models to conform with field observations. MEPTEC Lab. Memorandum, in preparation.

The corrected kinetic model for the Norton Sound Coal is shown and listed below. The distribution of activation energies is typical of other vitrinitic coals that we have analyzed by the Pyromat technique. When a 3°C/My heating rate is applied, the Norton Sound Coal behaves much more like the reference Herrin Coal sample than the Kimmeridge Clay Formation sample.

Please contact me (BM 381-8456) if you have any questions concerning the data or their interpretation.

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Technical Information

CCWalters
Enclosures