W907

APPENDIX 7

BASIC DATA

W907

SOURCE ROCK EVALUATION, OMEO-2A
VIC P-17, GIPPSLAND BASIN

Australian Aquitaine Petroleum Ltd

F3/422/0-6237/85 August 1985

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2/46

23 August 1985

F 3/422/0
F 6237/85 (Part 1)

Australian Aquitaine Petroleum Limited
99 Mount Street
NORTH SYDNEY NSW 2060

Attention: Mr C. Lambert

REPORT F 6237/85 (Part 1)

YOUR REFERENCE:	Transmittals 007530 and 017347
TITLE:	Source rock evaluation, Omeo-2, VIC P-17, Gippsland Basin
MATERIAL:	Sidewall cores
LOCALITY:	OMEO-2
IDENTIFICATION:	See Table 1 of report
DATE RECEIVED:	14 June and 16 July 1985
WORK REQUIRED:	TOC and Rock-Eval pyrolysis. Vitrinite reflectance and DOM descriptions. Interpretation

Investigation and Report by: Brian Watson

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1. INTRODUCTION

Twenty-one sidewall cores from Omeo-2 (Table 1) were received for source-rock analysis. Preliminary vitrinite reflectance data were telexed to C. Lambert on 7 July 1985. Rock-Eval pyrolysis of these samples is in progress, and the results will be incorporated in a subsequent report.

This report presents the data to hand, and a preliminary interpretation.

2. ANALYTICAL PROCEDURE

2.1 Sample Preparation

Sidewall core samples (as received) were ground in a Siebtechnik mill for 20-30 secs.

2.2 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (∿0.2 g) of powdered rock in 50% HCl to remove carbonates, followed by combustion in oxygen in the induction furnace of a Leco IR-12 Carbon Determinator and measurement of the resultant CO_2 by infra-red detection.

2.3 Rock-Eval Analysis

A 100 mg portion of powdered rock was analysed by the Rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operating mode, Cycle 1).

2.4 Organic Petrology

Representative portions of each sidewall core (crushed to -14+35 BSS mesh) were obtained with a sample splitter and then mounted in cold setting Astic resin using a 2.5 cm diameter mould. Each block was ground flat using diamond impregnated laps and carborundum paper. The surface was then polished with aluminium oxide and finally magnesium oxide.

Reflectance measurements on vitrinite phytoclasts, were made with a Leitz MPV1.1 m microphotometer fitted to a Leitz Ortholux microscope and calibrated aginst synthetic standards. All measurements were taken using oil immersion (n = 1.518) and incident monochromatic light (wavelength 546 nm) at a temperature at 24±1°C. Fluorescence observations were made on the same microscope utilising a 3 mm BG3 excitation filter, a TK400 dichroic mirror and a K510 suppression filter.

3. RESULTS

Analytical data are summarised and presented herein as follows:

	Table	Figure	Appendix
Total organic carbon (TOC)	2	-	-
Vitrinite reflectance (VR)	3	1	1
Dispersed organic matter (DOM)	4-6	-	2

4/46

4. PRELIMINARY INTERPRETATION

4.1 Maturity

Vitrinite reflectance data indicate that the sedimentary section penetrated by Omeo-2 is mature for the generation of light oil from resinite-rich DOM (threshold VR = 0.45 %) below ∿2500 metres depth.

Significant gas generation from woody-herbaceous DOM commences at VR = 0.6%. On this basis, the sediments below 3050 metres depth are mature enough to be potential sources of gas.

Oil generation from terrestrial organic matter rich in exinites other than resinite, suberinite and bituminite occurs within the vitrinite reflectance range VR = 0.7-1.2%. The top of this oil generation window occurs at ∿3250 metres depth in Omeo-2.

4.2 Organic Richness

Just over half of the SWC's analysed contain in excess of 1% TOC (Table 1), and therefore display good organic richness. High TOC values from 2475 and 2700 metres depth represent coals.

4.3 Kerogen Type and Source Quality

Although some samples contain significant quantities of vitrinite and exinite, the majority of the DOM in the Omeo-2 sequence is inertinite (Tables 4-6). The samples with the best source quality are listed below:

Depth (m)	Exinite (% of DOM)	Vitrinite (% of DOM)	TOC %
*2475	20	25	74.4
2566	60	-	1.01
2679	25	15	4.70
*2700	30	30	74.4
2705	25	30	2.40
2721 (shale)	85	5	[∿1-2]

*coal.
[] estimated from organic petrology.

4.4 Discussion

Sediments with the best source potential for liquid hydrocarbons are the resinite-rich coals (and associated epiclastics) which occur at 2475, 2679 and 2700.5 metres depth in Omeo-2. The maturity of these samples (VR = 0.45-0.57%) is sufficient for oil generation from the resinite to have commenced. Signs of oil generation and migration (viz. oil, bitumen and thucholite) are evident in both coals and clastics from this interval.

Deeper in the sequence, ?free oil was observed in many samples (Table 5), suggesting that maturation levels are adequate for hydrocarbon mobilisation. However, source quality is generally very poor (inertinite = 80-95% of DOM), and generation of oil in commercial quantities is unlikely.

TABLE 1: SAMPLES SUBMITTED FOR SOURCE-ROCK ANALYSIS, OMEO-2

Batch	SWC No.	Depth (m)
1	33	2475
	29	2528
	27	2566
	24	2609
	22	2639
	16	2679
	12	2700.5
	11	2705
	9	2721
	4	2759
2	28	2865
	25	2964
	22	3025
	20	3096
	18	3138
	17	3166
	13	3220
	10	3263
	7	3315
	3	3370
	2	3381

TABLE 2: TOTAL ORGANIC CARBON ANALYSES

Depth	TOC (%)
2475	74.4
2528	0.52
2566	1.01
2609	0.75
2639	1.04
2679	4.70
2700	74.4
2705	2.40
2721	0.47
2759	0.65
2865	0.56
2964	0.65
3025	2.85
3096	2.00
3138	2.75
3166	1.86
3220	2.25
3263	0.81
3315	1.48
3370	0.32
3381	0.43

TABLE 3: SUMMARY OF VITRINITE REFLECTANCE MEASUREMENTS, Omeo-2

Depth (m)	Mean Maximum Reflectance (%)	Standard Deviation	Range	Number of Determinations
2475	0.45	0.02	0.40-0.49	25
2528	0.45	0.04	0.38-0.55	25
2566	0.44	0.04	0.38-0.53	15
2609	0.48	0.04	0.41-0.54	9
2639	0.48	0.04	0.37-0.57	34
2679	0.53	0.05	0.43-0.66	34
2700	0.57	0.03	0.49-0.62	35
2705	0.55	0.05	0.46-0.65	34
2721	0.55	0.09	0.40-0.73	27
2759	0.62*	0.05	0.51-0.70	15
2865	0.55	0.07	0.46-0.71	12
2964	-	-	-	-
3025	0.71* (0.65)	0.11	0.50-0.87	33
3096	0.63	0.10	0.39-0.76	24
3138	0.62	0.03	0.55-0.65	11
3166	0.66	0.10	0.48-0.85	16
3220	0.66	0.05	0.55-0.73	18
3263	0.75	0.02	0.70-0.82	-
3315	0.73	0.09	0.60-0.92	19
3370	-	-	-	-
3381	0.85	0.07	0.52-0.98	15

*Influenced by reworked vitrinite.

()Preferred value.

TABLE 4: PERCENTAGE OF VITRINITE, INERTINITE AND EXINITE IN DISPERSED ORGANIC MATTER, Omeo-2

Depth (m)	Percentage of Vitrinite	Inertinite	Exinite
2475	25	55	20
2528	75	10	15
2566	-	40	60
2609	<5	70	30
2639	40	50	10
2679	15	60	25
2700	30	40	30
2705	30	45	25
2721 (Shale)	5	10	85
2721 (Sandstone)	40	60	-
2759	5	80	15
2865	10	80	10
2964	-	95	5
3025	30	65	5
3096	5	90	5
3138	5	90	5
3166	5	90	5
3220	5	90	<5
3263	<5	90	<5
3315	<5	90	<5
3370	-	95	<5
3381	<5	90	<5

TABLE 5: ORGANIC MATTER TYPE AND ABUNDANCE, Omeo-2

Depth (m)	Relative Maceral Group Proportions	Estimated Volume of DOM (%)	Estimated Volume of Exinites	Exinite Macerals
2475	I>V>E	>60	Ab	spo,res,bmite,lipto,cut, sub,fluor
2528	V>E>I	0.5-1	Ra	spo,cut,lipto,bmite,res, thuc
2566	E>I	0.5-1	Ra-Sp	lipto,cut,spo,?res
2609	I>E>V	0.5-1	Ra	spo,cut,bmen,lipto,thuc
2639	I>V>E	~1	Ra-Vr	lipto,spo,res
2679	I>E>V	2-5	Ra	bmite,lipto,spo,cut,res, ?oil
2700	I>V≧E	>60	Ab	res,spo,cut,lipto,sub, ?oil
2705	I>V>E	1-2	Ab	bmite,lipto,spo,cut,res
2721	I>E>V	0.5-1	Ra	lipto,spo,cut
2759	I>E>V	0.5-1	Ra	spo,lipto,cut,res,sub, bmen
2865	I>V≧E	~0.5	Ra	spo,cut,lipto,?oil
2964	I>E	~0.5	Ra-Vr	spo,cut,lipto,?oil
3025	I>V>E	1-2	Ra	spo,cut?res,lipto,lama,tela
3096	I>V≧E	1-2	Ra	spo,cut,lama,tela,bmen,?oil
3138	I>V≧E	1-2	Ra-Vr	spo,cut,?phyto,res,bmite,?oil
3166	I>V>E	3-5	Ra	lipto,spo,cut,?phyto
3220	I>V>E	3-5	Ra	lipto,spo,bmen,?phyto,cut
3263	I>V≧E	2-5	Ra-Vr	lipto,?phyto,spo,?tela
3315	I>V≧E	2-5	Ra-Vr	lipto,spo,phyto,cut,?oil
3370	I>E	1-2	Vr	lipto,?oil
3381	I>V≧E	0.5-1	Vr-Tr	lipto,spo,thuc,?oil

TABLE 6: EXINITE MACERAL ABUNDANCE AND FLUORESCENCE CHARACTERISTICS, Omeo-2

Depth (m)	Exinite Macerals	Lithology/Comments
2475	spo(Ab;mY-mO),res(Ab;mO-dO),bmite(Ab;dO-dB), lipto(Co;mY-dO),cut(Ra;mO),Sub(Ra;mO),fluor (Vr;iG-iY)	Coal; fluorescence colours of resinite indicate that the threshold for oil generation from this maceral has been reached.
2528	spo(Ra;mO),cut(Ra;mO),lipto(Vr;mY-dO), bmite(Vr-Tr;dO),res(Tr;mY-dO),thuc(Tr;dO)	60% siltstone, 40% shale; thucholite is evidence of oil migration.
2526	lipto(Ra-Sp;mY-mO),cut(Ra;mO),spo(Ra;mY-mO), ?res(Tr;iY)	Shale.
2609	spo(Ra;mY-mO),cut(Ra-Vr;mO),bmen(Ra-Vr;mY-dO), lipto(Ra-Vr;mY-mO),thuc(Tr;mO-dO)	Siltstone; thucholite and bitumen are evidence of oil migration.
2639	lipto(Ra-Vr;mY),spo(Ra-Vr;mY-mO),res(Vr;mY-mO)	Siltstone.
2679	bmite(Ra;dO),lipto(Ra;mY-mO),spo(Ra;mY-mO), cut(Vr;mY-dO),res(Tr;dO),?oil(Tr;iG)	Siltstone with coaly fragments; oil is associated with both the coal and siltstone.
2700	res(Ab;mY-dO),spo(co;mY-dO),sub(Ra;dO),lipto (Sp;mY-dO),sub(Ra;dO),?oil(Tr;iG)	Coal-up to 40% resinite; ?oil is probably generated insitu from the resinite and suberinite.
2705	bmite(Ab;dO),lipto(Sp;mY-mO),spo(Ra-Sp;mY-mO), cut(Ra;mO),res(Vr;mY-dO)	Silty shale.
2721	lipto(Ra;mY-mO),spo(Ra-Vr;mY-mO),cut(Ra-Vr; mO)	Chiefly sandstone, 20% shale; 50% of this shale is rich in DOM(1-2%) and contains abundant exinite.
2759	spo(Ra;mY-mO),lipto(Ra;mY-mO),cut(Vr;mO), res(Vr;mO-dO),sub(Tr;mO-dO),bmen(Tr;dO)	Silty sandstone; bitumen is a remnant of a migrated oil.
2865	spo(Ra;mY),cut(Vr;mO),lipto(Vr;mO),?oil (Tr;iG-iY)	Siltstone;?oil occurs as coatings on quartz grains.
2964	spo(Ra-Vr;mO),lipto(Vr;mO),cut(Tr;mO), ?oil(Tr;iG-iY)	Siltstone, ?oil as above.
3025	spo(Ra;mO),cut(Ra;mO-dO),?res(Vr;mO-dO), lipto(Vr;mO),lama(Tr;mO),tela(Tr;iO)	Siltstone with a few vitrinite rich coal fragments.
3096	spo(Ra;mO),cut(Ra-Vr;mO),lama(Tr;mO), tela(Tr;iO),bmen(Tr;dO),?oil(Tr;iY)	Siltstone; ?oil and bmen are associated with the quartz grains.
3138	spo(Ra-Vr;mO),cut(Vr;mO),?phyto(Vr;iY-iO), res(Tr;dO),bmite(Tr;dO),?oil(Tr;iY)	Siltstone, ?oil as above.
3166	lipto(Ra;mY-mO),spo(Vr;mO),cut(Vr-Tr;mO-dO), ?phyto(Tr;iY-mY)	Siltstone.
3220	lipto(Ra;mY-mO),spo(Vr;mO),?phyto(Vr;iY-mY), bmen(Vr;mO-dO),cut(Tr;mO)	Siltstone.

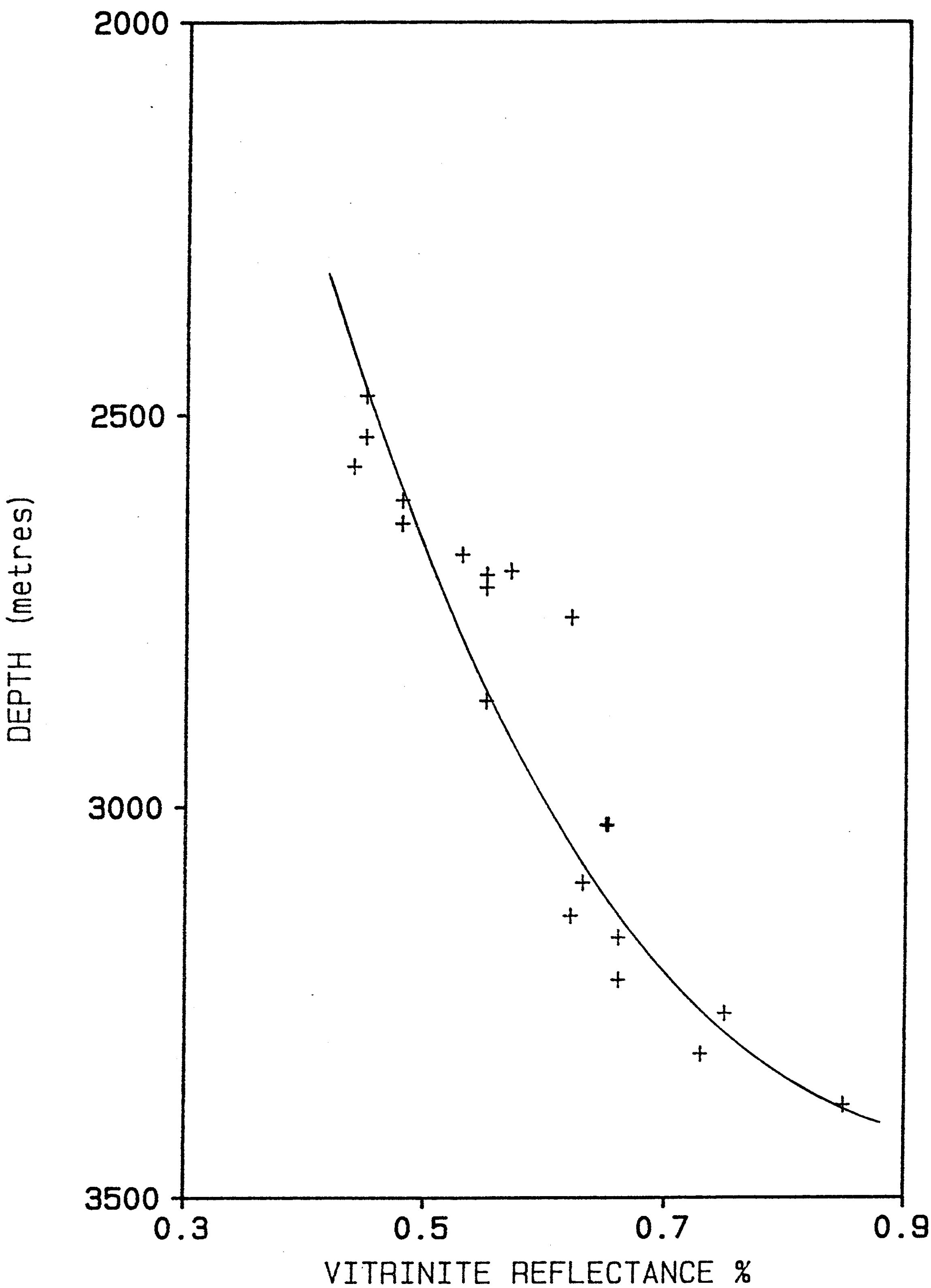
Continued/......

TABLE 6: (Continued)

Depth (m)	Exinite Macerals	Lithology/Comments
3263	lipto(Ra-Vr;mY-mO),?phyto(Vr;mY),spo(Vr-Tr;mO), tela(Tr;iO)	Siltstone (up to 10% sulphide.
3315	lipto(Ra-Vr;mY-mO),spo(Vr;mO-dO),?phyto(Vr-Tr;mY),cut(Tr;dO),?oil(Tr;iY)	Chiefly siltstone with sandy bands, sparse coal fragments; some coal fragments appear to be reworked ?oil as above.
3370	lipto(Vr;mO),?oil(Tr;iY)	Shale; ?oil as above.
3381	lipto(Vr-Tr;mO),spo(Tr;mO),thuc(Tr;dO-dB), ?oil(Tr;iY).	Shale; ?oil as above.

FIGURE 1 12/46

VITRINITE REFLECTANCE Vs. DEPTH PLOT, OMEO-2



APPENDIX 1

HISTOGRAMS OF REFLECTANCE MEASUREMENT

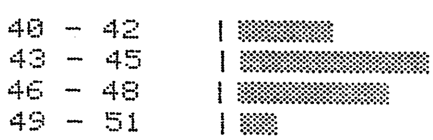
OMEO #2

2475 M

SORTED LIST
.4 .41 .42 .42 .42 .43 .43 .44 .44 .45
.45 .45 .45 .45 .45 .46 .46 .46 .47 .47
.47 .47 .48 .49 .49
Number of values= 25

MEAN OF VALUES .449
STD DEVIATION .023

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



15/46

OMEO #2

2528 M

SORTED LIST

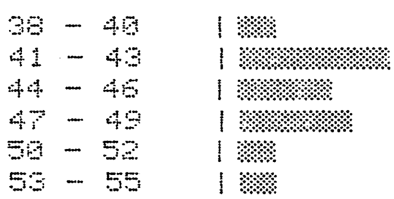
.38 .4 .41 .41 .42 .42 .43 .43 .43 .43
.44 .44 .45 .45 .46 .47 .47 .47 .47 .48
.48 .5 .5 .54 .55

Number of values= 25

MEAN OF VALUES .453
STD DEVIATION .04

HISTOGRAM OF RESULTS

Values are reflectance multiplied by 100



OMEO #2

2566 M

SORTED LIST
.38 .39 .4 .42 .42 .43 .43 .44 .44 .45
.45 .45 .47 .49 .53
Number of values= 15

MEAN OF VALUES .439
STD DEVIATION .037

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
38 - 40   |
41 - 43   |
44 - 46   |
47 - 49   |
50 - 52   |
53 - 55   |
```

OMEO #2

2609 M

SORTED LIST

```
.41   .46   .46   .47   .48   .5   .5   .53   .54
Number of values= 9
```

```
MEAN OF VALUES  .483
STD DEVIATION  .037
```

HISTOGRAM OF RESULTS

Values are reflectance multiplied by 100

```
41 - 43    |▒
44 - 46    |▒▒
47 - 49    |▒▒
50 - 52    |▒▒
53 - 55    |▒▒
```

18/46

OMEO #2

2639 M

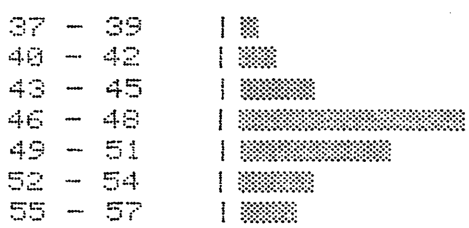
SORTED LIST

.37	.4	.41	.43	.43	.45	.45	.46	.46	.47
.47	.47	.47	.47	.48	.48	.48	.48	.48	.49
.49	.49	.49	.49	.51	.51	.51	.52	.53	.53
.54	.55	.55	.57						

Number of values= 34

MEAN OF VALUES .482
STD DEVIATION .043

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO #2

2679 M

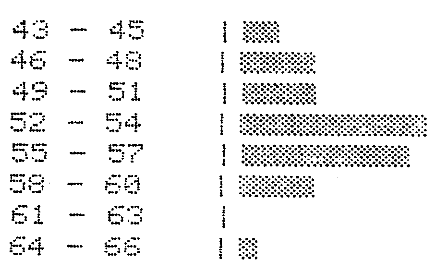
SORTED LIST

.43	.45	.46	.47	.47	.48	.49	.49	.49	.49
.52	.53	.53	.53	.53	.53	.53	.53	.54	.54
.55	.55	.55	.55	.56	.56	.56	.57	.57	.58
.59	.59	.6	.66						

Number of values= 34

MEAN OF VALUES .531
STD DEVIATION .047

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO #2

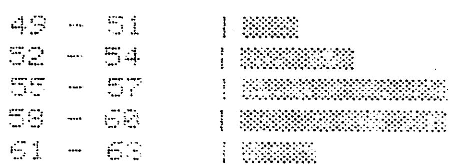
2700 M

SORTED LIST

.49 .49 .5 .52 .52 .53 .54 .54 .54 .55
.55 .55 .56 .56 .57 .57 .57 .57 .57 .57
.58 .58 .58 .58 .59 .59 .59 .59 .6 .6
.6 .61 .61 .62 .62
Number of values= 35

MEAN OF VALUES .566
STD DEVIATION .034

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO #2

2705 M

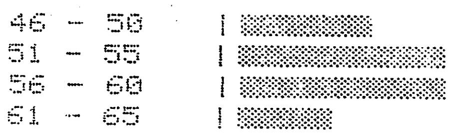
SORTED LIST

.46 .46 .47 .47 .48 .48 .5 .51 .51 .52
.52 .52 .53 .53 .54 .54 .54 .55 .56 .56
.56 .56 .57 .58 .58 .59 .6 .6 .6 .61
.61 .61 .62 .65

Number of values= 34

MEAN OF VALUES .547
STD DEVIATION .05

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO #2

2721 M

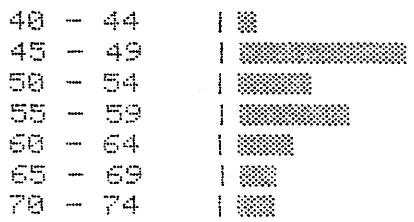
SORTED LIST

.4	.45	.46	.46	.46	.47	.48	.48	.49	.49
.5	.51	.53	.54	.56	.56	.57	.57	.58	.59
.6	.6	.64	.65	.69	.73	.73			

Number of values= 27

MEAN OF VALUES .548
STD DEVIATION .085

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO #2

2759 M

SORTED LIST
.51 .53 .57 .58 .59 .59 .62 .62 .63 .64
.65 .66 .68 .68 .7
Number of values= 15

MEAN OF VALUES .617
STD DEVIATION .053

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

51 - 55 |
56 - 60 |
61 - 65 |
66 - 70 |

OMEO # 2

2865 M

SORTED LIST
.46 .47 .49 .51 .51 .51 .53 .55 .56 .61
.65 .71
Number of values= 12

MEAN OF VALUES .547
STD DEVIATION .072

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
46 - 50    | ▒▒▒
51 - 55    | ▒▒▒▒▒
56 - 60    | ▒
61 - 65    | ▒▒
66 - 70    |
71 - 75    | ▒
```

OMEO # 2

3025 M

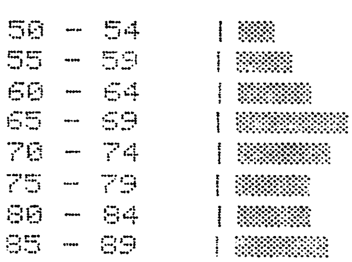
SORTED LIST

.5 .52 .55 .57 .57 .6 .61 .62 .63 .66
.66 .67 .68 .69 .69 .7 .72 .72 .72 .74
.75 .77 .78 .78 .8 .81 .84 .84 .85 .85
.85 .87 .87

Number of values= 33

MEAN OF VALUES .712
STD DEVIATION .106

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO # 2

3096 M

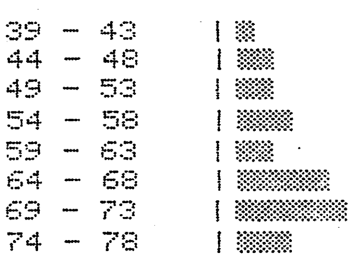
SORTED LIST

.39 .45 .47 .51 .53 .55 .56 .58 .59 .62
.64 .65 .66 .66 .68 .69 .69 .69 .72 .72
.73 .74 .76 .76

Number of values= 24

MEAN OF VALUES .627
STD DEVIATION .101

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO # 2

3138 M

SORTED LIST
.55 .6 .6 .62 .63 .63 .63 .63 .64 .65
.65
Number of values= 11

MEAN OF VALUES .621
STD DEVIATION .027

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

55 - 59 |
60 - 64 |
65 - 69 |

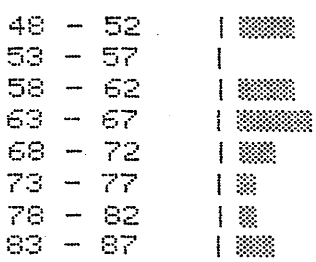
OMEO # 2

3166 M

SORTED LIST
.48 .52 .52 .6 .6 .61 .63 .65 .65 .65
.69 .7 .73 .79 .83 .85
Number of values= 16

MEAN OF VALUES .656
STD DEVIATION .104

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



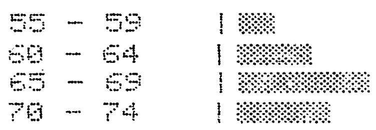
OMEO # 2

3220 M

SORTED LIST
.55 .58 .61 .63 .64 .64 .65 .65 .65 .66
.67 .67 .69 .7 .72 .72 .73 .73
Number of values= 18

MEAN OF VALUES .661
STD DEVIATION .049

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



30/46

OMEO # 2

3263 M

SORTED LIST
.7 .7 .74 .78 .82
Number of values= 5

MEAN OF VALUES .748
STD DEVIATION .047

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

70 - 74	░░░
75 - 79	░
80 - 84	░

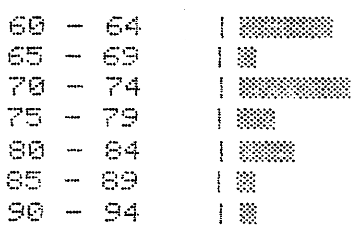
OMEO # 2

3315 M

SORTED LIST
.6 .64 .64 .64 .64 .66 .7 .7 .72 .72
.74 .74 .76 .76 .8 .8 .84 .88 .92
Number of values= 19

MEAN OF VALUES .732
STD DEVIATION .085

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100



OMEO # 2

3381 M

SORTED LIST
.54 .58 .64 .8 .86 .88 .88 .88 .88 .9
.94 .98 .98 .98 .98
Number of values= 15

MEAN OF VALUES .847
STD DEVIATION .141

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
54 - 58    |▒▒
59 - 63    |
64 - 68    |▒
69 - 73    |
74 - 78    |
79 - 83    |▒
84 - 88    |▒▒▒▒▒
89 - 93    |▒
94 - 98    |▒▒▒▒▒
```

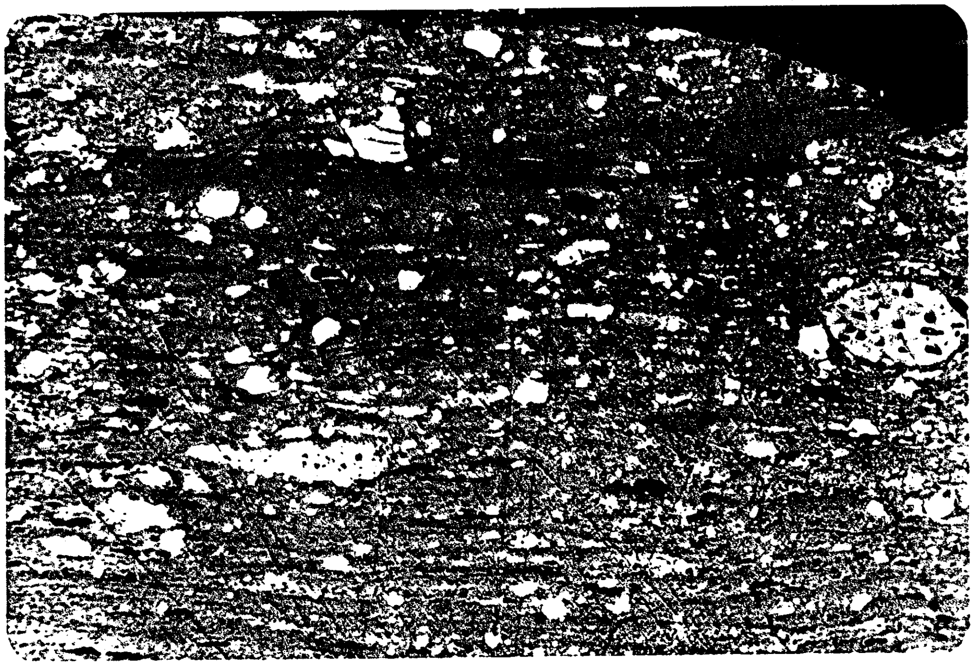


PLATE 1: 2475 m Reflected Light

This is a vitrinite rich coal fragment containing abundant inertinite (light grey-white) and exinite (black-dark grey)

Field Dimension 0.43 mm x 0.29 mm

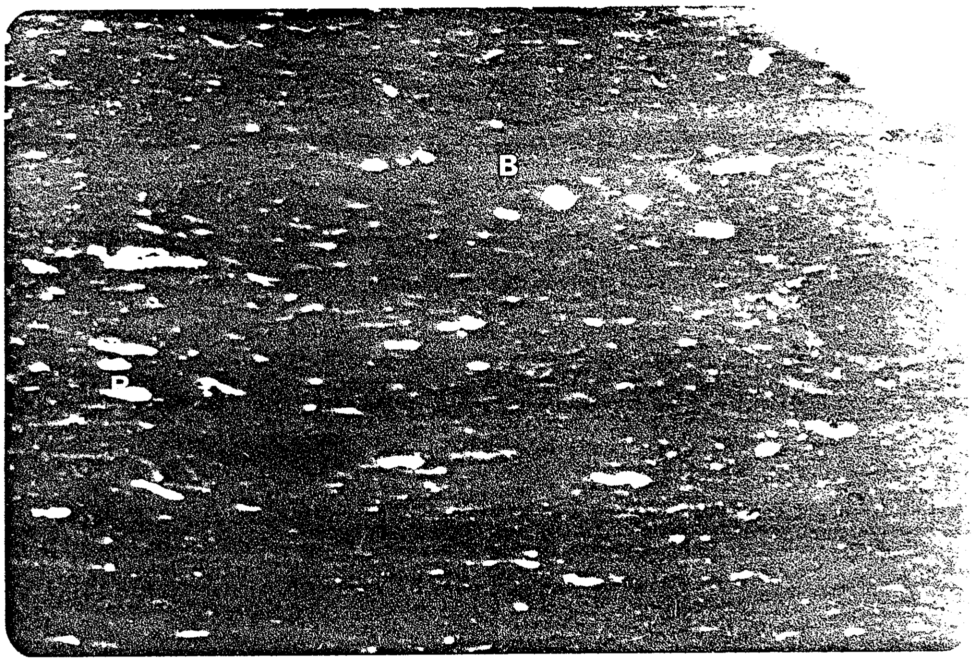


PLATE 2: 2475 m Fluorescence Mode

In fluorescence mode the exinite macerals resinite (R), fluorinite (F), cutinite (C) and bituminite (B) are more easily distinguished.

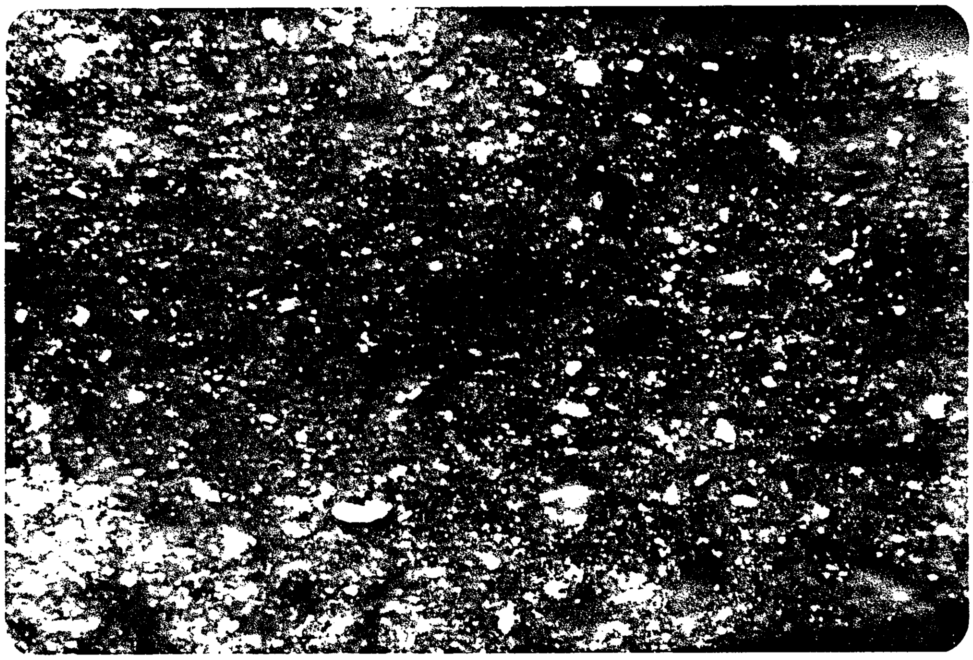


PLATE 3: 2566 m Reflected Light

This is a typical Field of View of this shale showing exinite (brown) and inertinite (white).
Field Dimensions 0.43 mm x 0.29 mm

PLATE 4: 2566 m Fluorescence Mode

The exinite macerals in this shale are sporinite (lower right), cutinite (centre and centre left) and liptodetrinite (dispersed exinite fragments).

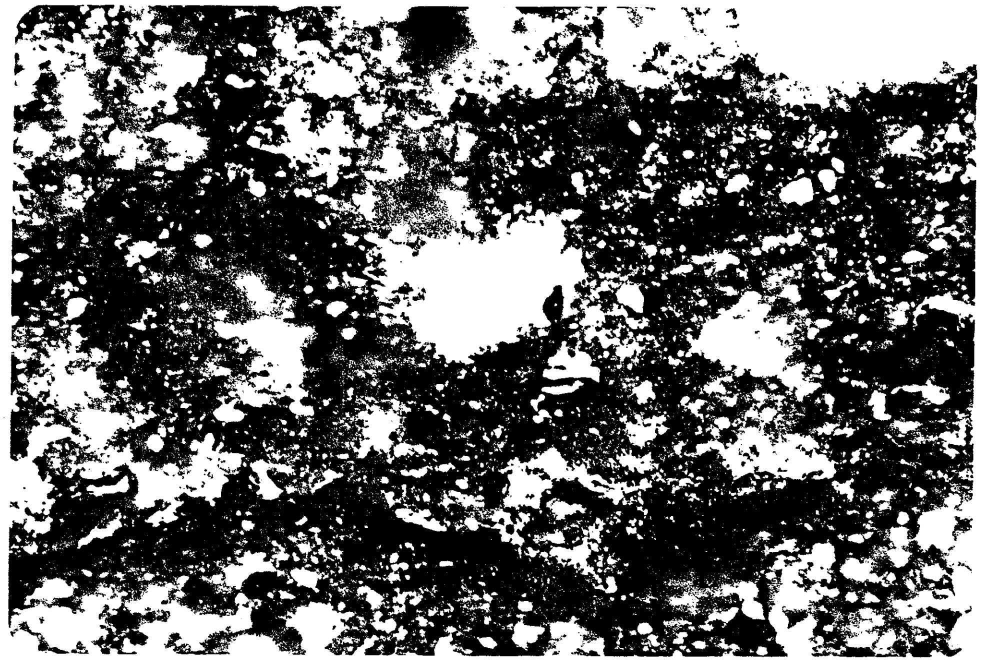


PLATE 5: 2679 m Reflected Light

This is a fairly Typical Field of View for this sample showing inertinite (white) and exinite (brown).
Field Dimensions 0.43 mm x 0.29 mm

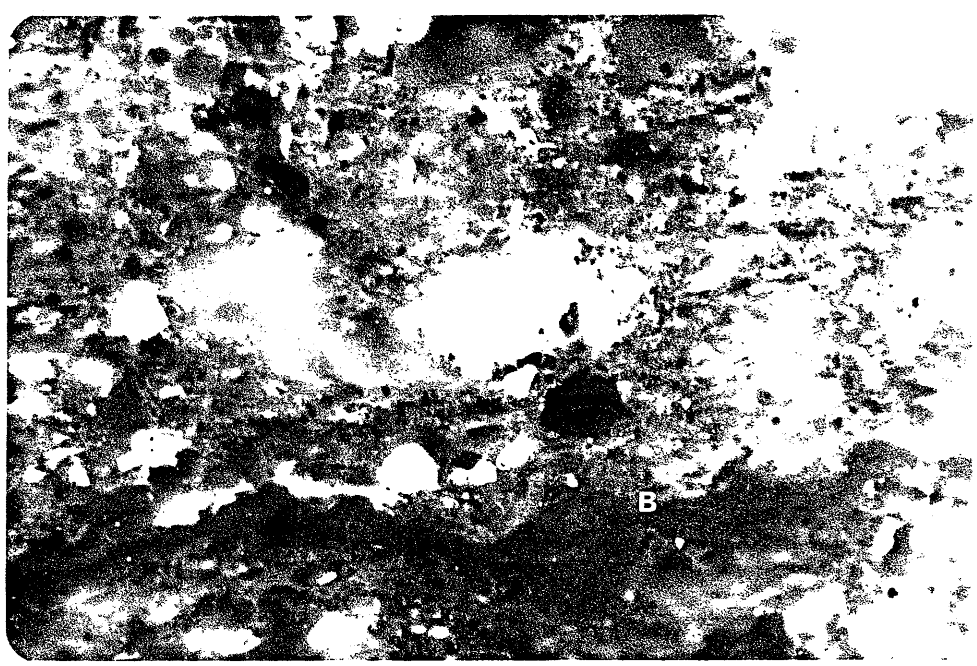


PLATE 6: 2679 m Fluorescence Mode

In fluorescence mode bituminite (B) and liptodetrinite (moderate orange fluorescence) are identified as well as small accumulations of ?oil (o).

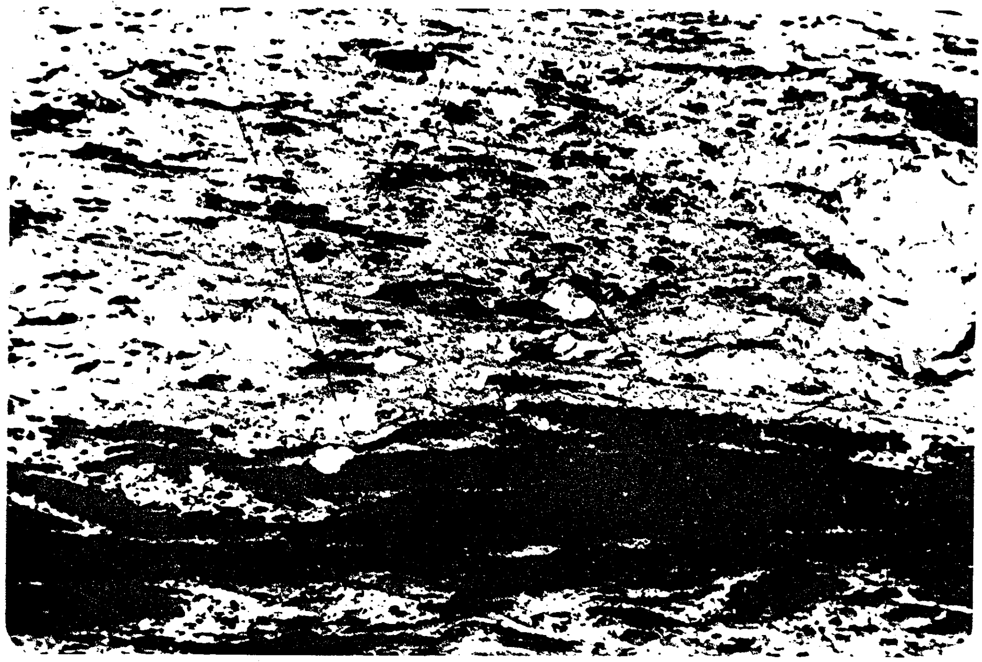


PLATE 7: 2700 m Reflected Light

This is a resinite rich coal containing vitrinite (grey), inertinite (white) and exinite (brown).
Field Dimension 0.43 mm x 0.29 mm

PLATE 8: 2700 m Fluorescence Mode

In fluorescence mode small accumulations of ?oil (o) possibly generated from the resinite (moderate orange) are distinguished in this coal.

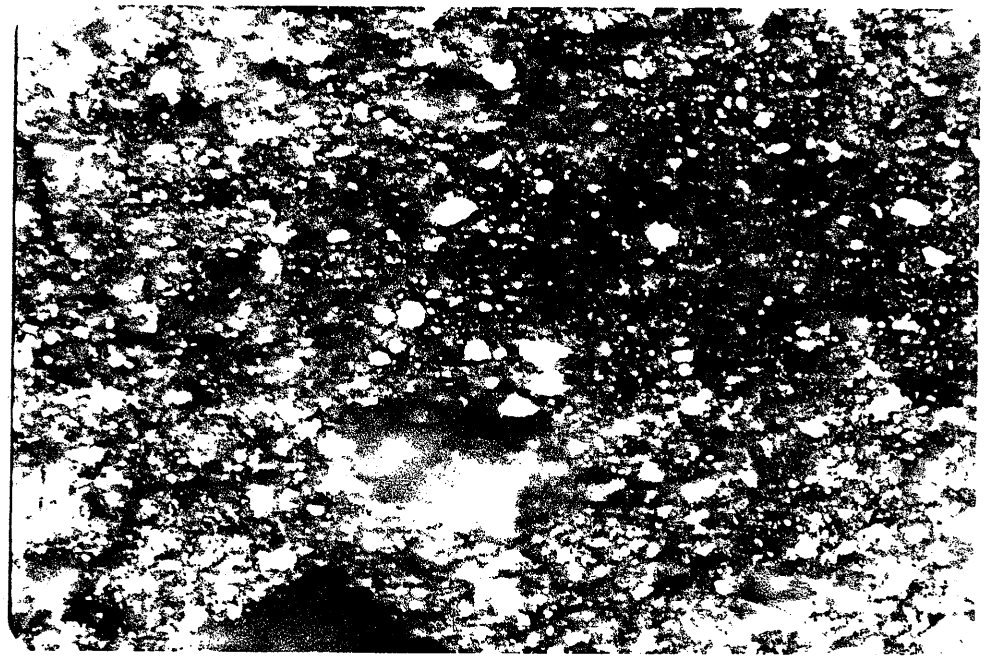


PLATE 9: 2721 m Reflected Light

This is a Typical Field of View of the exinite (brown) rich shale in this sample.
Field Dimensions 0.43 mm x 0.29 mm

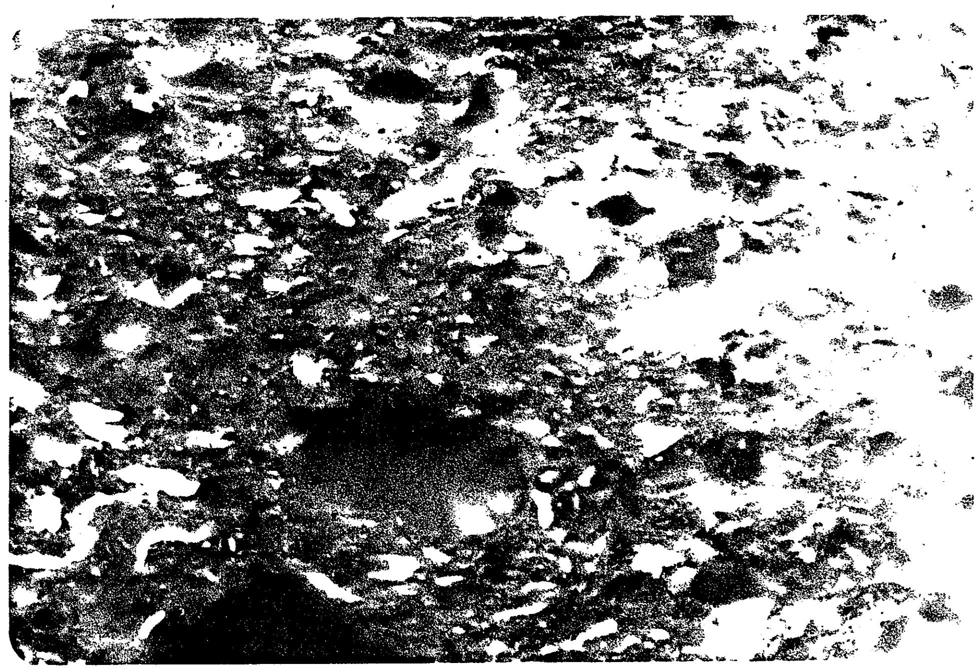


PLATE 10: 2721 m Fluorescence Mode

The exinite macerals in this shale are cutinite (C), sporinite and liptodetrinite.

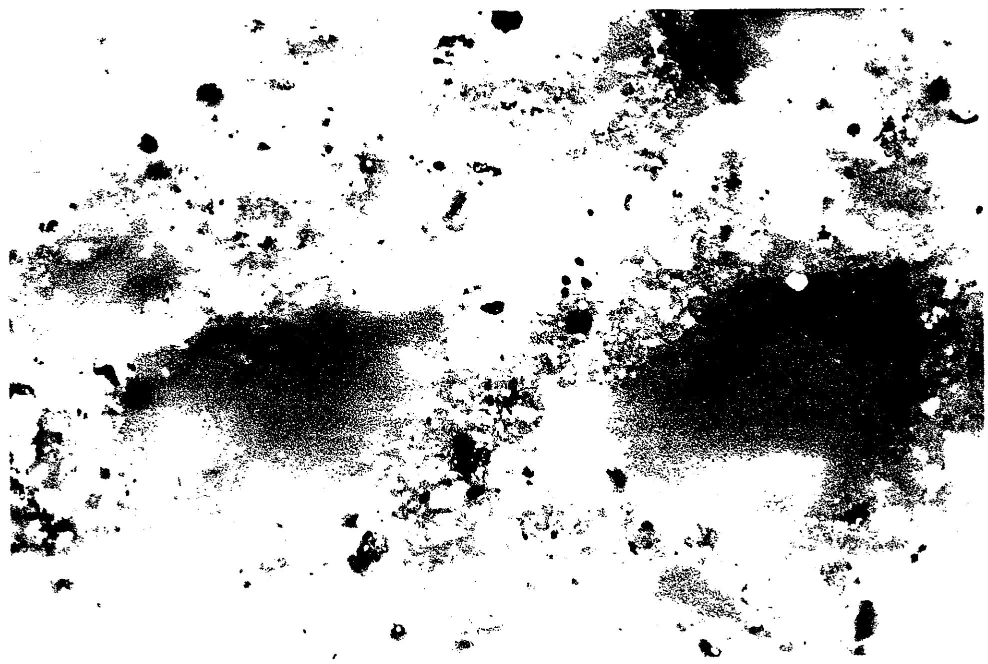


PLATE 11: 2865 m Reflected Light

This plate shows small accumulations of ?oil trapped in the siltstone.

Field Dimensions 0.26 mm x 0.18 mm

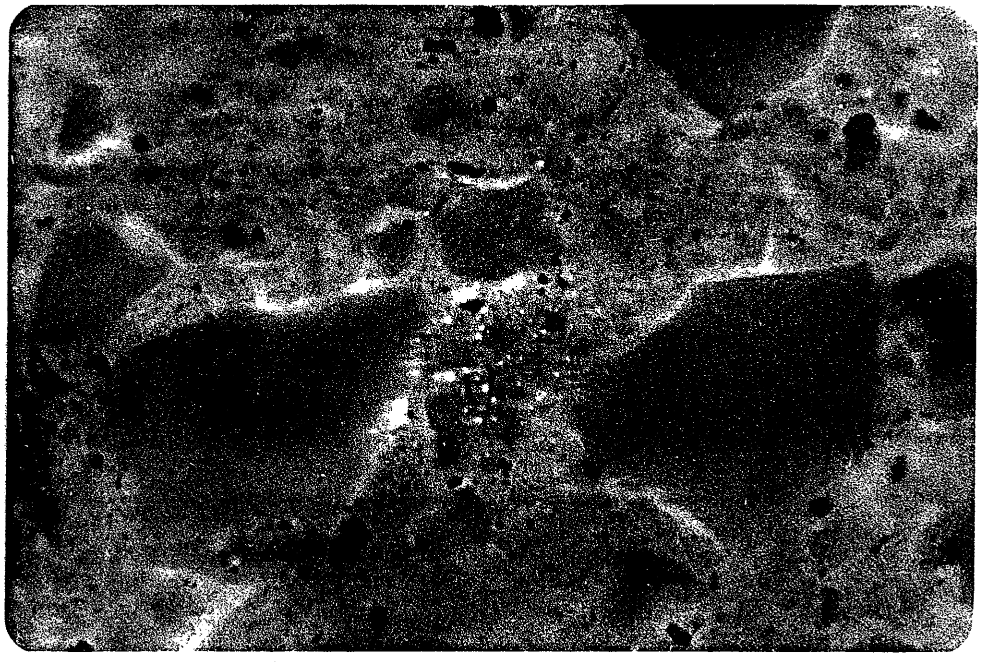


PLATE 12: 2865 m Fluorescence Mode

These small accumulations of ?oil are associated with the coarser mineral grains.

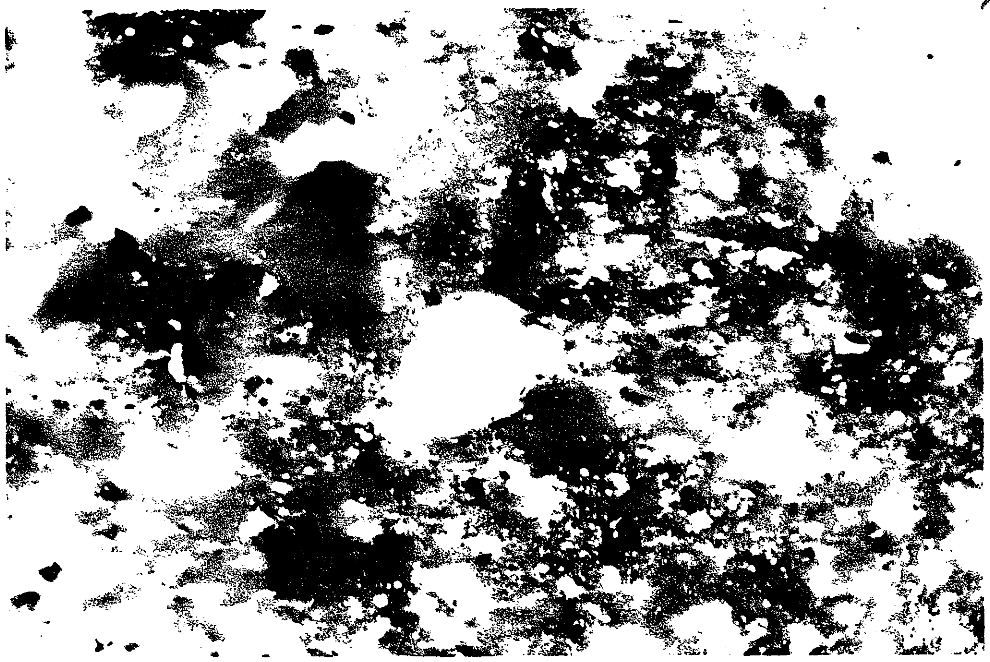


PLATE 13: 3096 m Reflected Light

This plate shows ?oil (brown) in an inertinite rich siltstone.
Field Dimensions 0.43 mm x 0.29 mm

PLATE 14: 3096 m Fluorescence Mode

The intense fluorescing ?oil can be seen in this plate, below the surface of the section, interstitial to quartz grains.

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SA 5063
In reply quote:

40/46

amdel

25 September 1985

F 3/422/0
F 6237 - Part 2 (Final)

Australian Aquitaine Petroleum Limited
99 Mount Street
NORTH SYDNEY NSW 2060

Attention: Mr C. Lambert

REPORT F 6237 - Part 2 (Final)

YOUR REFERENCE:	Transmittals 007530 and 017347.
TITLE:	Source rock evaluation, Omeo-2, VIC P-17, Gippsland Basin.
IDENTIFICATION:	See Table 1 of report.
MATERIAL:	Sidewall cores.
LOCALITY:	OMEO-2.
DATE RECEIVED:	14 June and 16 July 1985.
WORK REQUIRED:	TOC and Rock-Eval pyrolysis. Vitrinite reflectance and DOM descriptions. Interpretation.

Investigation & Report by: Brian Watson.

Chief
Petroleum Services Section: Dr Brian G Steveson.

for Dr William G Spencer
Manager
Mineral & Materials Sciences Division

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1. INTRODUCTION

Twenty one sidewall cores from Omeo-2 (Table 1) were received for source rock analysis. Preliminary vitrinite reflectance data were telexed to C Lambert on 7 July 1985. Descriptions of the dispersed organic matter were presented in Part 1 of this report along with the final vitrinite reflectance data and a preliminary interpretation.

This report presents the Rock-Eval pyrolysis data and a final interpretation.

2. ANALYTICAL PROCEDURE

2.1 Sample Preparation

Sidewall core samples (as received) were ground in a Siebtechnik mill for 20-30 secs.

2.2 Total Organic Carbon (TOC)

Total organic carbon was determined by digestion of a known weight (~0.2 g) of powdered rock in 50% HCl to remove carbonates, followed by combustion in oxygen in the induction furnace of a Leco IR-12 Carbon Determinator and measurement of the resultant CO_2 by infra-red detection.

2.3 Rock-Eval Analysis

A 100 mg portion of powdered rock was analysed by the Rock-Eval pyrolysis technique (Girdel IFP-Fina Mark 2 instrument; operation mode, Cycle 1).

2.4 Organic Petrology

Representative portions of each sidewall core (crushed to -14+35 BSS mesh) were obtained with a sample splitter and then mounted in cold setting Astic resin using a 2.5 cm diameter mould. Each block was ground flat using a diamond impregnated laps and carborundum paper. The surface was then polished with aluminium oxide and finally magnesium oxide.

Reflectance measurements on vitrinite phytoclasts, were made with a Leitz MPV1.1 microphotometer fitted to a Leitz Ortholux microscope and calibrated against synthetic standards. All measurements were taken using oil immersion (n = 1.518) and incident monochromatic light (wavelength 546 nm) at a temperature at 23±1°C. Fluorescence observations were made on the same microscope utilising a 3 mm BG3 excitation filter, a TK400 dichroic mirror and a K510 suppression filter.

3. RESULTS

The TOC and Rock Eval data is presented in Table 2. Figure 1 is a Tmax verses Hydrogen index plot for Omeo-2 illustrating kerogen type and maturity.

4. DISCUSSION

4.1 Maturity

Tmax values are in the range 430-450°C over the 2475-3381 metres depth interval (Table 1). These values are in good agreement with the measured vitrinite reflectance (VR = 0.45 - 0.85%; F6237 [Part 1] 23 August 1985) and indicate sedimentary section is:-

1. Mature for the generation of light oil from resinite-rich DOM (threshold VR = 0.45%) below ~2500 metres depth.

2. Mature for the generation of gas from woody-herbaceous DOM (threshold VR = 0.6%) below ~3050 metres depth.

3. Mature for the generation of oil from terrestrial organic matter rich in exinites other than resinite, suberinite and bituminite (threshold VR = 0.7%) below ~3250 metres depth.

Although primarily maturation dependent, the Rock-Eval production index is also sensitive to the presence of migrated hydrocarbons. Production indicies greater than 0.2 indicate the presence of migrated hydrocarbons in the following samples:-

2721 m
2865 m
2964 m
3263 m
3381 m

4.2 Source Richness

Source richness for hydrocarbons is variable in the interval 2475-2705 metres depth and is fair to poor below 2721 metres. Four samples have excellent source richness, indicated by potential hydrocarbon yields (S_1+S_2) of 8.6 - 207 kg hydrocarbons/tonne (Table 1). The source richness and organic richness of three of these four samples is attributable to the presence of coal.

4.3 Source Quality and Kerogen Type

Hydrogen indicies fall in the range HI = 22-308 (Table 1, Fig 1) and suggests that most of these samples contain organic matter with the bulk composition of Type IV and Type III organic matter (Fig 1). Samples with the bulk composition of type II-III organic matter occur in the interval 2475-2865 metres depth. The samples with the best source quality as indicated by the Rock-Eval data are listed on page 3.

Depth (m)	TOC (%)	S_1+S_2 kg hydrocarbons/tonne	HI
2475*	74.4	207.06	260
2679	4.70	13.62	266
2700*	74.4	194.90	242
2705	2.40	8.60	308

* coal

5. CONCLUSIONS

5.1 Sediments with the best source potential for liquid hydrocarbons are the resinite-rich coals (and associated epiclastics) which occur at 2475, 2679 and 2700 metres depth in Omeo-2. The maturity of these samples (VR = 0.45 - 0.57%) is sufficient for oil generation from the resinite to have commenced. Signs of oil generation and migration (viz. oil, bitumen and thucholite) are evident in both coals and clastics from this interval.

5.2 Source quality is generally very poor below 3050 metres depth (inertinite = 80-95% of DOM, HI <140, S_1+S_2 <4 kg hydrocarbons/tonne) where maturity is sufficient for gas and oil generation from resinite poor terrestrial organic matter. Therefore, the generation of commercial quantitites of oil or gas from these sediments is unlikely.

44/46

TABLE 1: SAMPLES SUBMITTED FOR SOURCE-ROCK ANALYSIS, OMEO-2

Batch	SWC No.	Depth (m)
1	33	2475
	29	2528
	27	2566
	24	2609
	22	2639
	16	2679
	12	2700.5
	11	2705
	9	2721
	4	2759
2	28	2865
	25	2964
	22	3025
	20	3096
	18	3138
	17	3166
	13	3220
	10	3263
	7	3315
	3	3370
	2	3381

TABLE 2

AMDEL

ROCK-EVAL PYROLYSIS

18/09/85

Client AUSTRALIAN AQUITAINE PETROLEUM

Well OMEO-2

DEPTH	T MAX	S1	S2	S3	S1+S2	PI	S2/S3	PC	TOC	HI	OI
2475.00	433	13.79	193.27	0.34	207.06	0.07	568.44	17.25	74.40	260	0
2528.00	441	0.08	1.39	0.06	1.47	0.05	23.16	0.12	0.52	267	12
2566.00	441	0.07	2.42	1.36	2.49	0.03	1.77	0.20	1.01	240	135
2609.00	436	0.15	0.90	0.00	1.05	0.14	0.00	0.08	0.75	120	0
2639.00	434	0.26	1.69	0.22	1.95	0.13	7.68	0.16	1.04	162	21
2679.00	430	1.10	12.52	0.19	13.62	0.08	65.89	1.13	4.70	266	4
2700.00	443	15.08	179.82	0.00	194.90	0.08	0.00	16.24	74.40	242	0
2705.00	441	1.22	7.38	0.50	8.60	0.14	14.76	0.71	2.40	308	21
2721.00	438	0.11	0.26	0.32	0.37	0.31	0.81	0.03	0.47	55	68
2759.00	434	0.10	0.55	0.09	0.65	0.16	6.11	0.05	0.65	85	14
2865.00	428	0.84	1.43	3.55	2.27	0.37	0.40	0.18	0.56	255	634
2964.00	448	0.07	0.16	0.15	0.23	0.32	1.06	0.01	0.65	25	23
3025.00	442	0.37	4.61	0.07	4.98	0.07	65.85	0.41	2.85	162	2
3096.00	443	0.17	1.51	0.00	1.68	0.10	0.00	0.14	2.00	76	0
3138.00	443	0.26	2.88	0.16	3.14	0.08	18.00	0.26	2.75	105	6
3166.00	448	0.28	1.64	0.01	1.92	0.15	164.00	0.16	1.86	88	1
3220.00	446	0.39	3.01	0.25	3.40	0.11	12.04	0.28	2.25	134	11
3263.00	450	0.11	0.18	0.30	0.29	0.39	0.60	0.02	0.81	22	37
3315.00	444	0.15	1.12	0.07	1.27	0.12	16.00	0.10	1.48	76	5
3381.00	436	0.06	0.21	0.38	0.27	0.23	0.55	0.02	0.43	49	88

FIGURE 1

46/46

Client : AUSTRALIAN AQUITAINE PETROLEUM
Well name : OMEO-2