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ONSHORE

VITRINITE REFLECTANCE DETERMINATIONS
AND MACERAL ANALYSES

WESTERN MINING CORPORATION Ltd

R503

VITRINITE REFLECTANCE DETERMINATIONS AND MACERAL ANALYSES

Western Mining Corporation Ltd,

F3/10/1/0-5743/84 September, 1983

The Australian Mineral Development Laboratories

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15 September, 1983

F3/10/1/0
5743/84

Western Mining Corporation Ltd,
(Exploration Division - Eastern Region),
PO Box 157,
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Attention: Gary M. Meyer

REPORT F5743/84

YOUR REFERENCE:	Letter of 8 August, 1983
MATERIAL:	Coals and shales
LOCALITY:	Bonaparte Gulf Basin
IDENTIFICATION:	DA097480-DA097489
DATE RECEIVED:	12 August 1983
WORK REQUIRED:	Mean maximum vitrinite reflectance determinations and maceral analyses

Investigation and Report by: Brian L. Watson

Chief - Fuel Section: Dr Brian G. Steveson
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for Brian S. Hickman
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1. INTRODUCTION

Ten coal and shale samples from the Bonaparte Gulf Basin, Northern Territory were received from Western Mining Corporation Limited, (Exploration Division - Eastern Region) for mean maximum vitrinite reflectance determinations and maceral analyses.

2. EXPERIMENTAL METHODS

Representative portions of each sample were separated using a sample splitter and then mounted in cold setting Glasscraft resin using a 2.5 cm round mould. Each block was ground flat using diamond impregnated laps and carborundum papers. This surface was then polished with aluminium oxide and finally magnesium oxide.

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

Macerals analyses (% by volume) were calculated from point count data collected using a Swift automatic point counter. Three hundred to four hundred data points were counted on each block with 0.5 mm between points and 0.6 mm between adjacent traverses. When necessary, additional points were counted to complete the final traverse. Traverses were perpendicular to laminations caused by preparation techniques.

3. REFLECTANCE MEASUREMENTS

The mean maximum reflectance measurements were taken on vitrinite (telocollinite). The results of these measurements are listed in Table 1. This reflectance data is presented in histogram form in Appendix 1.

4. MACERAL ANALYSES

The maceral analyses results for sample DA097480-DA097483 are presented in Table 2. Figures in brackets refer to the volume of the maceral groups.

5. DISCUSSION

The coals from Keep River No.1 are classified as subbituminous C (DA097480 and DA097481) and high volatile bituminous coals (DA097482 and DA097483). The mean maximum reflectance determinations on these coals range from 0.41% (DA097480) to 0.56% (DA097483). The shales from Moyle No.1 and Kulshill No.2 appear to have a similar rank gradient to that of Keep River No.1 (0.5% $\bar{R}v$ max/km). All of the samples examined are also of a similar rank. The paucity of vitrinite in some samples has limited the possible number of reflectance determinations. In these samples the accuracy and precision of the reflectance determinations may have been impaired and the resultant mean maximum reflectance measurements should only be regarded as an indication of rank.

The maceral analyses of samples DA097480 to DA097483 illustrate a change in organic matter type in these coals. Vitrinite occupies approximately one-third of the volume of the coals in sample DA097483 and comprises the majority of the organic matter in sample DA097482. In sample DA097481 vitrinite occupies slightly more than one-third of the organic matter in the coals and occupies approximately one-quarter of the volume of the coals in sample DA097480. The coals are chiefly vitrinertites so that these fluctuations in vitrinite content are paralleled by fluctuations in inertinite content. These variations in organic matter type indicate changes in the environment of deposition from an oxidising environment in sample DA097483 to a more reducing environment in sample DA097482 and back to a more oxidising environment in samples DA097481 and DA097480. The presence of lamalginite and telalginite in sample DA097480 possibly indicates a lacustrine environment of deposition. The fluctuation of vitrinite and inertinite content in these coals is illustrated in a series of plates included in Appendix 2.

Mineral matter is coarser grained in the stratigraphically higher units. This is reflected in the proportions of clay/silt-sized mineral matter and discrete quartz grains in these samples. This may indicate a trend towards a higher energy environment. Quartz grains are generally quite well-rounded and range up to 1.5 mm in diameter in sample DA097480. Sulphides are present in trace to sparse amounts and are generally not intimately associated with the coals.

TABLE 1: REFLECTANCE MEASUREMENTS

Hole	Depth (m)	Sample	Mean Maximum Reflectance (%)	Range	Standard Deviation	Number of Determinations
Keep River No.1	49-52	DA097480	0.41	0.34-0.51	0.04	57
	58-61	DA097481	0.43	0.32-0.50	0.04	46
	116-119	DA097482	0.45	0.35-0.54	0.04	58
	347-351	DA097483	0.56	0.50-0.64	0.03	57
Moyle No.1	137-140	DA097484	0.44	0.36-0.50	0.05	16
	271-274	DA097485	-	-	-	-
	415-418	DA097486	0.55	0.44-0.67	0.07	13
Kulshill No.2	549-522	DA097487	0.37	0.31-0.44	0.04	28
	713-716	DA097488	0.42	0.34-0.48	0.04	9
Kulshill No.1	293-296	DA097489	0.37	0.29-0.47	0.04	51

TABLE 2: MACERAL ANALYSES (% by volume)

Sample		DA097480		DA097481		DA097482		DA097483	
Vitrinite	Telinite	-	(3.4)	-	(7.3)	sp	(18.1)	-	(3.3)
	Telocollinite	3.4		7.3		16.5		3.3	
	Corpocollinite	-		-		sp		ra	
	Gelocollinite	tr		-		-		-	
	Desmocollinite	sp		tr		1.6		-	
Inertinite	Semifusinite	1.6	(11.8)	ra	(11.1)	sp	(sp)	ra	(6.3)
	Fusinite	-		-		sp		sp	
	Macinite	4.3		7.8		ra		1.4	
	Inertodetrinite	5.9		3.3		1.9		4.9	
	Sclerotinite	-		tr		-		-	
Exinite	Sporinite	sp	(sp)	sp	(sp)	ra	(sp)	tr	(ra)
	Cutinite	tr		-		ra		tr	
	Resinite	ra		ra		sp		ra	
	Telalginite	ra		tr		-		-	
	Lamalginite	ra		tr		-		-	
	Liptodetrinite	tr		tr		tr		tr	
Mineral Matter	Clay/silt-sized	16.3	(81.9)	44.8	(79.5)	49.2	(76.3)	52.5	(88.3)
	Quartz	65.6		34.7		27.1		35.8	
	Sulphides	ra		sp		tr		sp	

KEY

sp = sparse = 0.5-1.0%

ra = rare = 0.1-0.5%

tr = trace = seen but not counted in point count

Figures in brackets refer to the volume of the maceral groups.

APPENDIX 1

HISTOGRAMS OF REFLECTANCE DATA

U. M. C.

DA 097480

SORTED LIST

.34 .35 .36 .36 .36 .37 .37 .37 .37 .37
.37 .38 .38 .38 .38 .38 .38 .39 .39 .39
.39 .39 .39 .39 .39 .4 .4 .4 .4 .4
.4 .41 .41 .41 .41 .42 .42 .42 .42 .42
.43 .43 .43 .43 .44 .44 .44 .45 .45 .45
.45 .46 .47 .48 .49 .5 .51

Number of values= 57

MEAN OF VALUES .408
STD DEVIATION .038

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
34   | *
35   | *
36   | ***
37   | *******
38   | *******
39   | *********
40   | *******
41   | ****
42   | *****
43   | ****
44   | ***
45   | ****
46   | *
47   | *
48   | *
49   | *
50   | *
51   | *
```

W. M. C.

DA 097481

SORTED LIST

.32 .35 .38 .38 .39 .39 .39 .4 .4 .4
.41 .41 .41 .42 .42 .42 .42 .43 .43 .43
.43 .43 .44 .44 .44 .44 .44 .44 .44 .45
.45 .45 .45 .46 .46 .46 .46 .46 .46 .46
.47 .47 .47 .48 .49 .5
Number of values= 46

MEAN OF VALUES .431
STD DEVIATION .035

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
32   | *
33   |
34   |
35   | *
36   |
37   |
38   | **
39   | ****
40   | ****
41   | ****
42   | *****
43   | ******
44   | *********
45   | *****
46   | *********
47   | ****
48   | *
49   | *
50   | *
```

W.M.O.

DA 097482

SORTED LIST

.35	.36	.4	.41	.41	.41	.41	.41	.41	.42
.42	.42	.42	.42	.43	.43	.43	.43	.43	.43
.44	.44	.44	.45	.45	.45	.45	.46	.46	.46
.46	.46	.46	.46	.46	.46	.46	.47	.47	.47
.47	.47	.48	.48	.48	.48	.48	.49	.49	.49
.5	.5	.5	.51	.51	.52	.53	.54		

Number of values= 58

MEAN OF VALUES .453
STD DEVIATION .038

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
35   | *
36   | *
37   |
38   |
39   |
40   | *
41   | *******
42   | ******
43   | *******
44   | ***
45   | ****
46   | ************
47   | ******
48   | ******
49   | ***
50   | ***
51   | **
52   | *
53   | *
54   | *
```

M.M.C.

DA 097483

SORTED LIST

.5 .5 .51 .51 .51 .52 .52 .52 .53 .53
.53 .53 .53 .53 .53 .54 .54 .54 .54 .54
.54 .55 .55 .55 .55 .55 .55 .55 .55 .55
.56 .56 .56 .56 .56 .56 .56 .57 .57 .57
.57 .58 .58 .58 .58 .59 .59 .59 .6 .6
.6 .61 .61 .62 .62 .63 .64

Number of values= 57

MEAN OF VALUES .558
STD DEVIATION .033

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
50   | **
51   | ****
52   | ****
53   | *********
54   | *******
55   | ***********
56   | ********
57   | *****
58   | *****
59   | ****
60   | ****
61   | **
62   | **
63   | *
64   | *
```

DA 097484

SORTED LIST
.36 .37 .38 .4 .41 .41 .42 .44 .45 .46
.47 .48 .49 .49 .5 .5
Number of values= 16

MEAN OF VALUES .439
STD DEVIATION .046

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
36   |*
37   |*
38   |*
39   |
40   |*
41   |**
42   |*
43   |
44   |*
45   |*
46   |*
47   |*
48   |*
49   |**
50   |**
```

W. M. C.

DA 097486

SORTED LIST
.44 .48 .48 .5 .53 .53 .54 .55 .57 .57
.63 .64 .67
Number of values= 13

MEAN OF VALUES .548
STD DEVIATION .065

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
44   | *
45   |
46   |
47   |
48   | **
49   |
50   | *
51   |
52   |
53   | **
54   | *
55   | *
56   |
57   | **
58   |
59   |
60   |
61   |
62   |
63   | *
64   | *
65   |
66   |
67   | *
```

W. M. C.

DA 097487

SORTED LIST

.31 .32 .33 .33 .33 .34 .34 .34 .34 .35
.35 .36 .36 .37 .38 .38 .39 .39 .4 .4
.4 .41 .41 .41 .42 .43 .43 .44
Number of values= 28

MEAN OF VALUES .374
STD DEVIATION .037

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
31   | *
32   | *
33   | ***
34   | *****
35   | **
36   | **
37   | *
38   | **
39   | **
40   | ***
41   | ***
42   | *
43   | **
44   | *
```

DA 097488

SORTED LIST
.34 .38 .4 .41 .43 .44 .46 .46 .48
Number of values= 9

MEAN OF VALUES .422
STD DEVIATION .042

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
34   | *
35   |
36   |
37   |
38   | *
39   |
40   | *
41   | *
42   |
43   | *
44   | *
45   |
46   | **
47   |
48   | *
```

DA 097489

SORTED LIST

.29	.31	.31	.32	.32	.33	.33	.33	.33	.34
.34	.34	.34	.34	.34	.35	.35	.35	.35	.35
.36	.36	.36	.36	.36	.37	.37	.37	.37	.37
.38	.38	.38	.38	.39	.39	.39	.4	.4	.41
.41	.41	.42	.42	.42	.43	.44	.44	.44	.45
.47									

Number of values= 51

MEAN OF VALUES .372
STD DEVIATION .04

HISTOGRAM OF RESULTS
Values are reflectance multiplied by 100

```
29   |*
30   |
31   |**
32   |**
33   |****
34   |*******
35   |******
36   |******
37   |******
38   |****
39   |***
40   |**
41   |***
42   |***
43   |*
44   |***
45   |*
46   |
47   |*
```

APPENDIX 2

PHOTOMICROGRAMS OF SAMPLES DA097480-DA097483

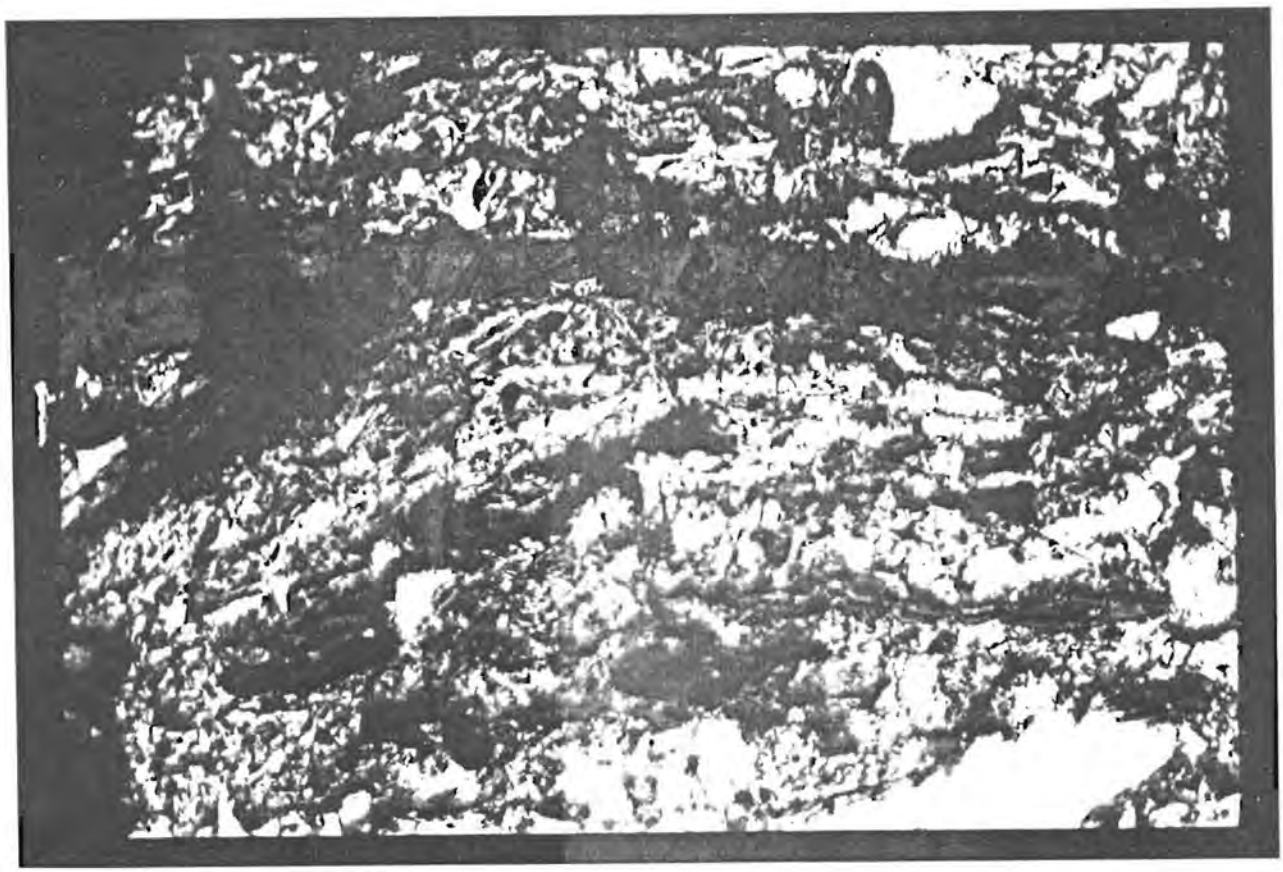

PLATE 1: DA097480 Reflected Light

This plate shows an inertinite rich vitrinertite coal. The majority of the organic matter in this coal is inertinite (white). Vitrinite (grey) occurs in a band towards the top of the field and exinite (dark grey to brown) is dispersed throughout the coal.

Field Dimensions 0.26 mm x 0.18 mm

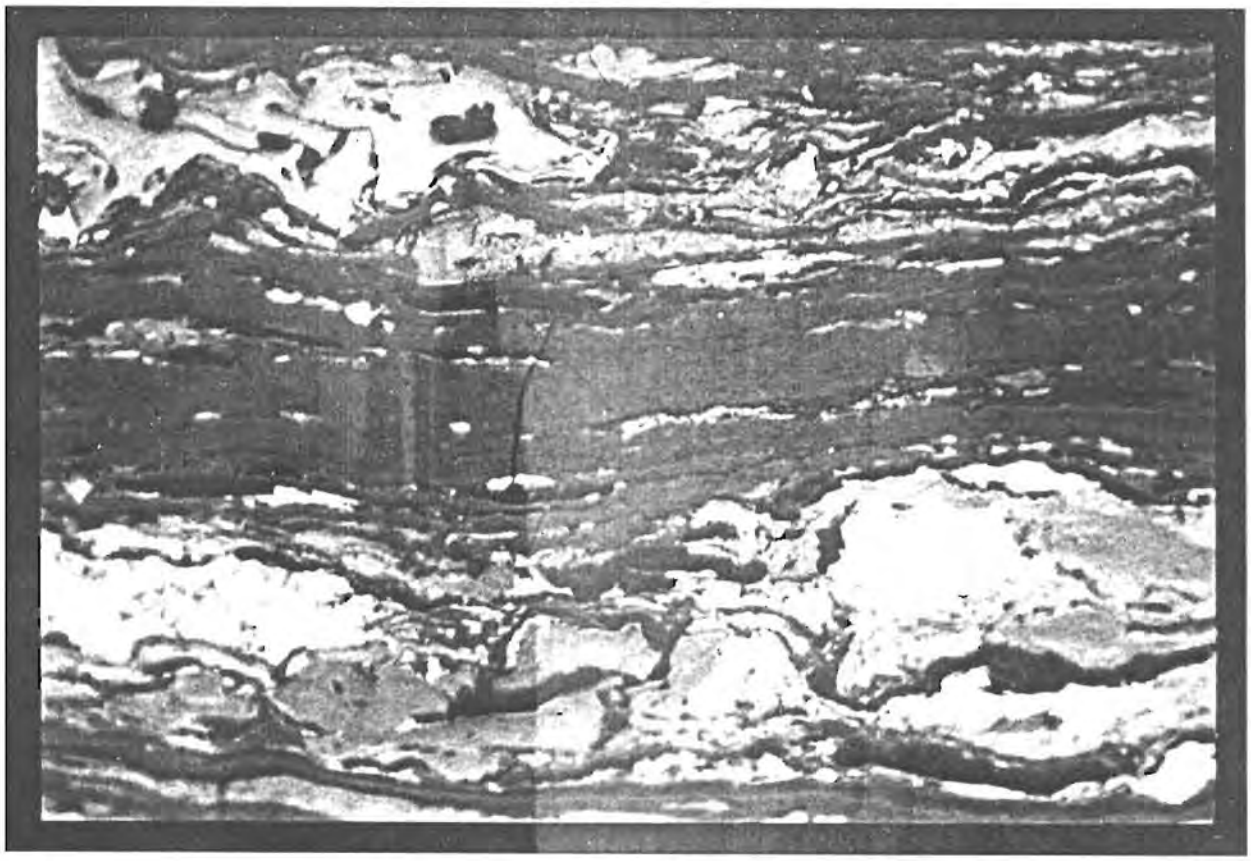

PLATE 2: DA097481 Reflected Light

Vitrinite is much more abundant in this vitrinertite than in that of Plate 1. Exinite is quite abundant but is thought to occupy less than 5% of the coal volume.

Field Dimensions 0.26 mm x 0.18 mm

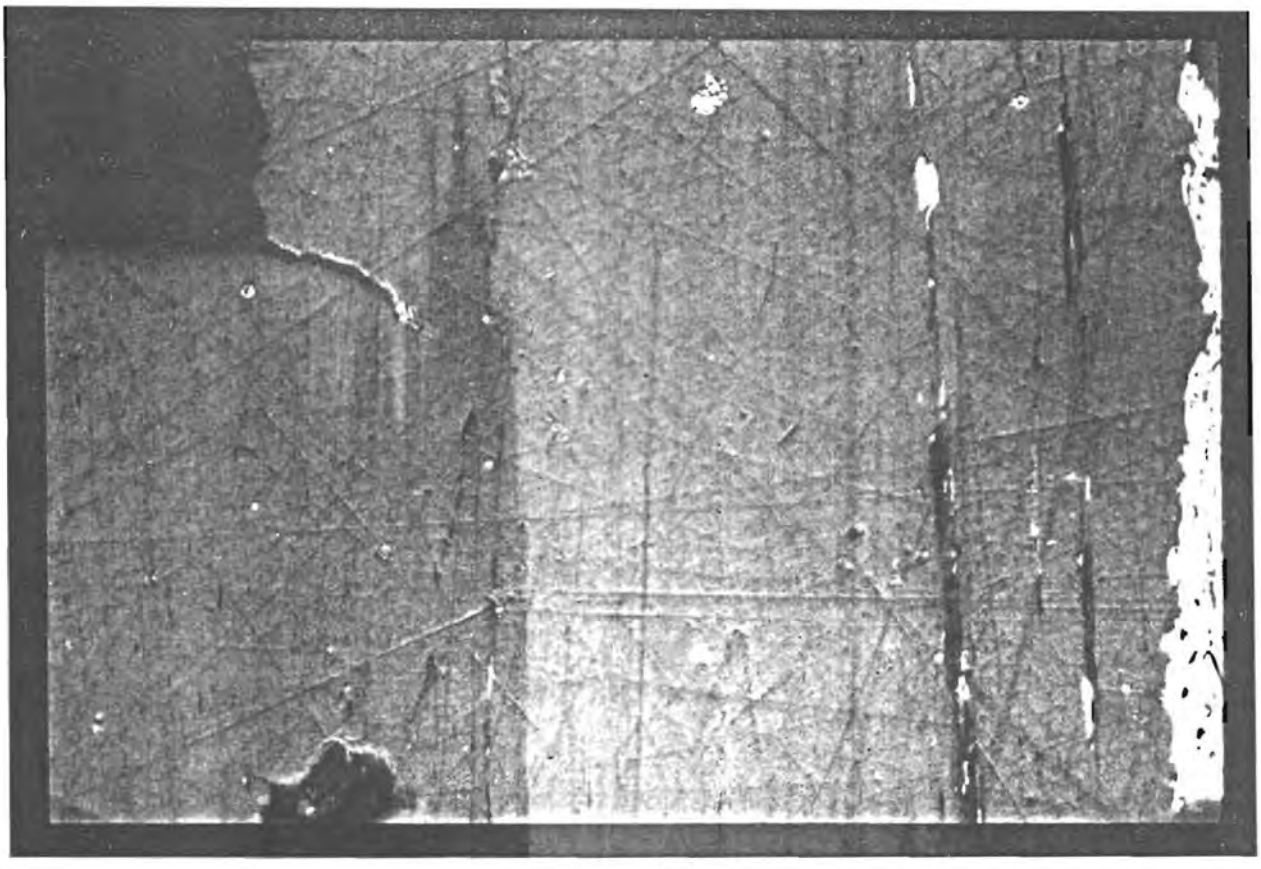

PLATE 3: DA097482 Reflected Light

The majority of this coal consists of vitrinite (grey). Inertinite (white) and exinite (brown) are present in minor amounts.

Field Dimensions 0.26 mm x 0.18 mm

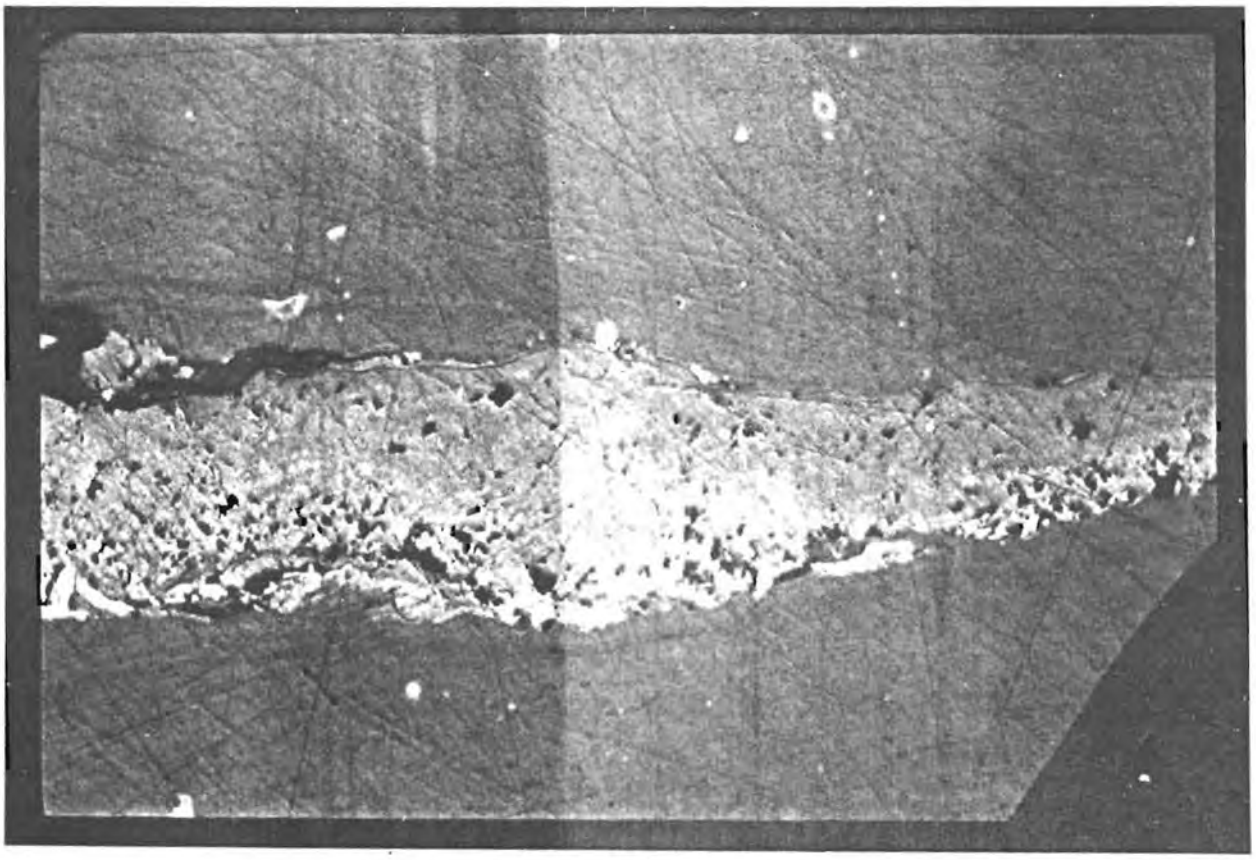

PLATE 4: DA097483 Reflected Light

Inertinite is more abundant in this coal than in that of Plate 3, but is not as abundant as the coals in Plates 1 and 2.

Field Dimensions 0.26 mm x 0.18 mm