ANALYTICAL REPORT

SOURCE ROCK
ORGANIC MATTER REFLECTANCE
AND TYPING

OLYMPUS MONS #1 WELL

PREPARED FOR
MARTIAN OIL PROSPECTING COMPANY

APRIL 2050

Energy Resources Consulting Pty Ltd
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SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

INTRODUCTION

Samples were received (see table below) to be evaluated for the reflectance of organic matter (vitrinite where possible) as well as an assessment of the types of organic matter present.

ERC Sample No.	Company Reference	Sample Type	Other information
E9997	2060-2070	Cuttings	
E9998	2160-2180	Cuttings	
E9999	2180-2200	Cuttings	

METHODS

Sample preparation methods may vary slightly depending upon whether core/ outcrop or cuttings were received.

With core and outcrop samples, a flat face perpendicular to bedding is prepared by grinding. This is placed in a 30 mm diameter mould along with several randomly oriented grains. The whole is mounted in epoxy resin.

With cuttings, the samples are passed though a 2 mm sieve and where necessary are gently cracked in a mortar and pestle. This is then mounted in epoxy resin.

The epoxy resin mounted samples are polished using a variety of wet and dry papers, diamond polishing compounds and colloidal silica. The polished samples are dried in a desiccator for a minimum of 12 hours prior to analysis.

Analysis is made using a Leica MP4500P system with Hilgers DISKUS software. A mechanical stage is used to traverse the sample in a regular pattern. Mean maximum reflectance in oil of the organic matter is determined by rotating the microscope stage. Reflectance is determined of a 2 μm^2 area at 546nm using a total magnification of 500X. A visual estimation of organic matter types and abundances was also made using comparison charts under both reflected and blue light excitation. The categories used are:

Descriptor	%
Absent	0
Rare	<0.1
Sparse	0.1< x <0.5
Common	0.5< x <2.0
Abundant	2.0< x <10.0
Major	10.0< x <40.0
Dominant	>40.0

The samples are also examined in blue light fluorescence using a Royal Blue LED as the excitation source.

RESULTS

Results are tabulated as follows. Low resolution images are provided in an appendix for reference purposes. High quality images are provided in a separate image file.

Data presentation

Individual sample results are reported in the following format:

ERC No. Client No.	Depth (ft / m)	$\bar{R}_{Vmax}$ *1	Range*2	SD*3	N*4
x1234	3106 $\bar{R}_I$ *5 Alginite*5 Bitumen*5	0.79	0.64 - 0.91	0.145	25

*1 Mean of all the maximum reflectance readings obtained.
*2 Lowest Rmax and highest Rmax of the population considered to represent the first generation vitrinite population.
*3 Standard Deviation
*4 Number of fields measured (Number of measurements = 2N because 2 maximum values are recorded for each field)
*5 Reflectance of multiple vitrinite populations or of other organic matter types. $\bar{R}_I$ = Inertinite mean maximum reflectance etc; subscripts may be expanded as necessary.

HAWK data, where requested, are reported separately in spread sheet format.

Note that if samples are retained by ERC, they will be held for at least 12 months after reporting but may be discarded after that date.

COMPANY REF	Depth (m)	$\overline{R}$ vmax	Range	SD	N	COMPANY WELL NAME Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence
E9997 -xxxx-1 Ctgs	- $\overline{R}_I$	0.52 1.31	0.39-0.65 0.83-1.66	0.056 0.304	25 5	Abundant sporinite and sparse liptodetrinite yellow to orange, common cutinite orange, sparse resinite greenish yellow, sparse suberinite weak brown. (Claystone>shaly coal>coal. Shaly coal major, V>L>I, clarite. Shaly coal comprises about 20% of the sample and approximate maceral composition on mineral free basis: vitrinite65%; liptinite 30%; inertinite 5%. Coal common, V>L>I, clarite>vitrite. Dom common, V>L>I. Vitrinite and liptinite common, inertinite rare. Mineral fluorescence weak orange.. Iron oxides rare. Pyrite rare.)
E9998 -xxxx-2 Ctgs	- $\overline{R}_I$	0.50 1.15	0.39-0.59 0.72-1.83	0.048 0.421	25 5	Sparse sporinite and rare liptodetrinite yellow to orange, orange, rare to sparse cutinite orange. (Claystone> siltstone>sandstone>shaly coal. Shaly coal sparse, V>L>I, clarite. Dom sparse to common, V>L>I. Vitrinite and liptinite sparse, inertinite rare. Mineral fluorescence weak to moderate orange. Glauconite common. Iron oxides common. Pyrite sparse.)
E9999 -xxxx-3 Ctgs	- $\overline{R}_I$	0.51 1.11	0.38-0.68 0.91-1.59	0.065 0.247	25 5	Sparse sporinite and rare liptodetrinite yellow to orange, rare cutinite orange. (Claystone>siltstone>shaly coal>coal. Shaly coal sparse, V>L>I, clarite. Coal rare, V, vitrite. Dom common, V>L>I. Vitrinite sparse to common, liptinite and inertinite rare. Mineral fluorescence moderate to strong orange. Iron oxides rare. Pyrite rare.)

Plates

E9997A Vitrinite in shaly coal, Rv max=0.48%, reflected white light, X50
E9997B Same as E0101A, in fluorescence mode
E9997C Cross section of a leaf with cutinite and remnants of epidermal cells, fluorescence mode, X50
E9998A Detrovitrinite in claystone, Rv max=0.53%, reflected white light, X50
E9998B Same as E0102A, in fluorescence mode
E9998C Shaly coal of clarite composition, Rv max=0.55%, reflected white light, X50
E9998D Same as E0102C, in fluorescence mode
E9999A Clarite coal, Rv max=0.0.50%, reflected white light, X50
E9999B Same as E0103A, in fluorescence mode
E9999C Detrovitrinite in siltstone, Rv max=0.56%, reflected white light, X50

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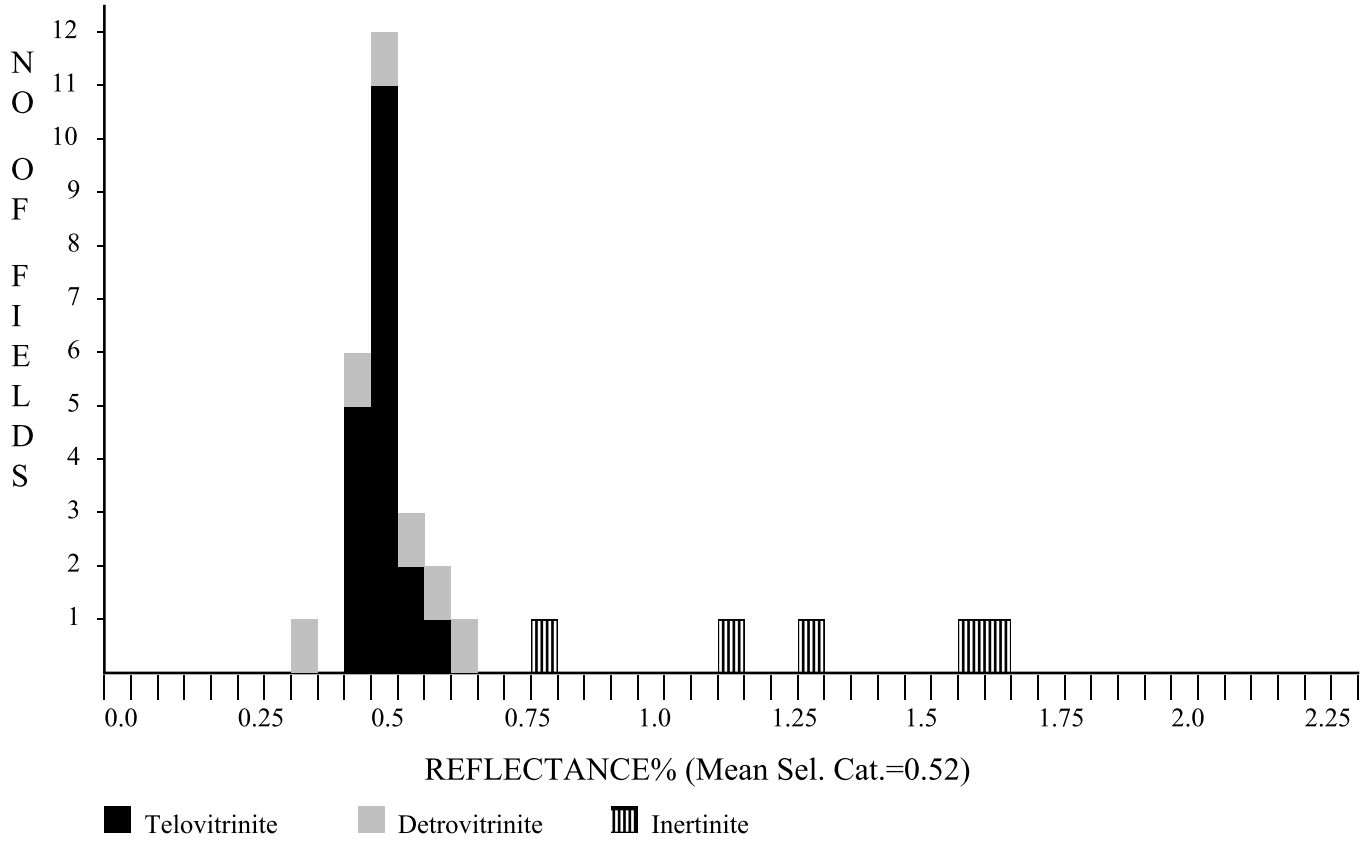
Sample Report, xxxx-1, Ctgs(E9997)



Maceral Category	N	Mean	Standard Deviation
Telovitrinite	19	0.51	0.041
Detrovitrinite	6	0.53	0.088
Inertinite	5	1.31	0.304
Total	30	0.65	0.325

Selected categories: Telovitrinite,Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.52
Standard Deviation of Selected categories:	0.056

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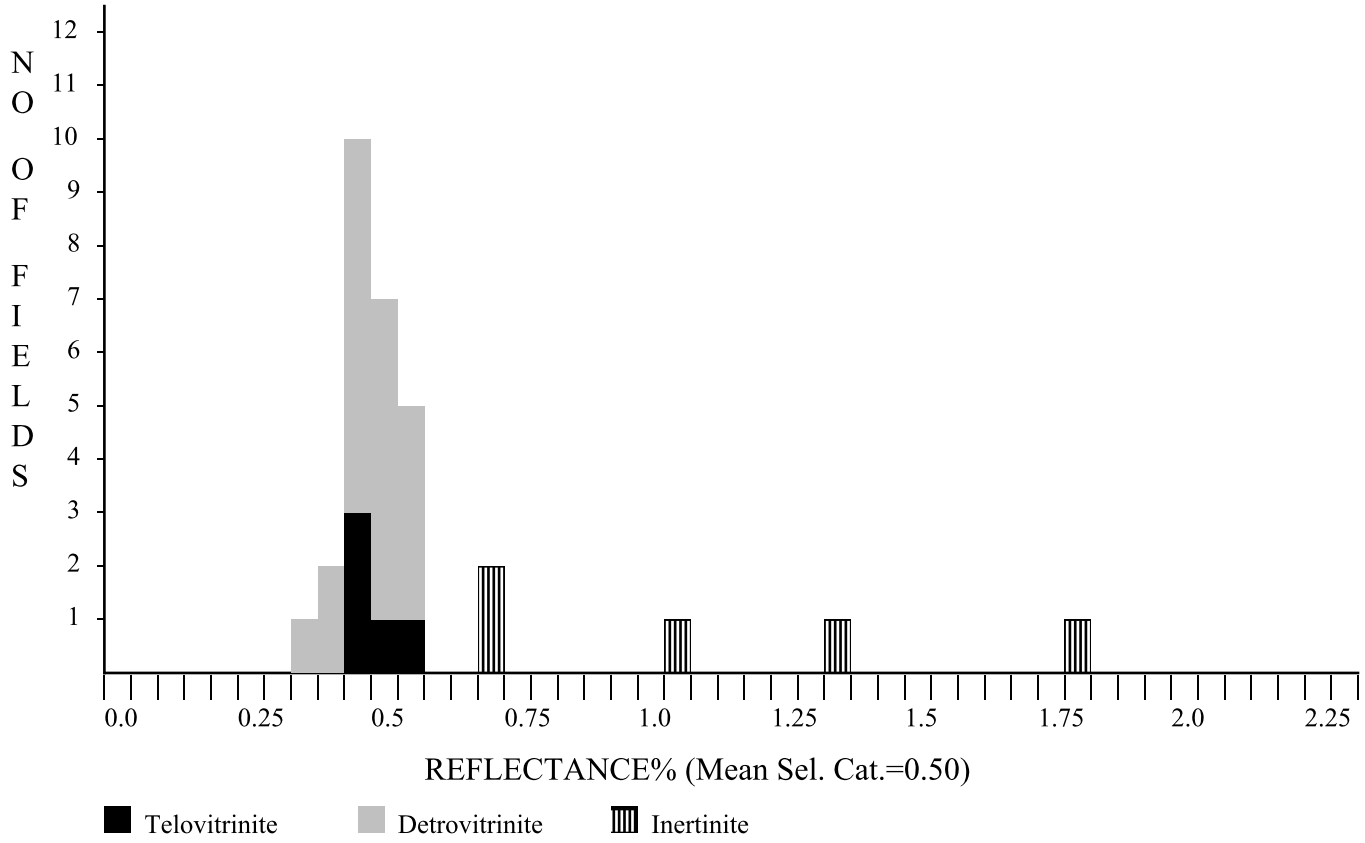
Saple Reports, xxxxx-2, Ctgs(E9998)



Maceral Category	N	Mean	Standard Deviation
Telovitrinite	5	0.50	0.030
Detrovitrinite	20	0.50	0.052
Inertinite	5	1.15	0.421
Total	30	0.61	0.300

Selected categories: Telovitrinite,Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.50
Standard Deviation of Selected categories:	0.048

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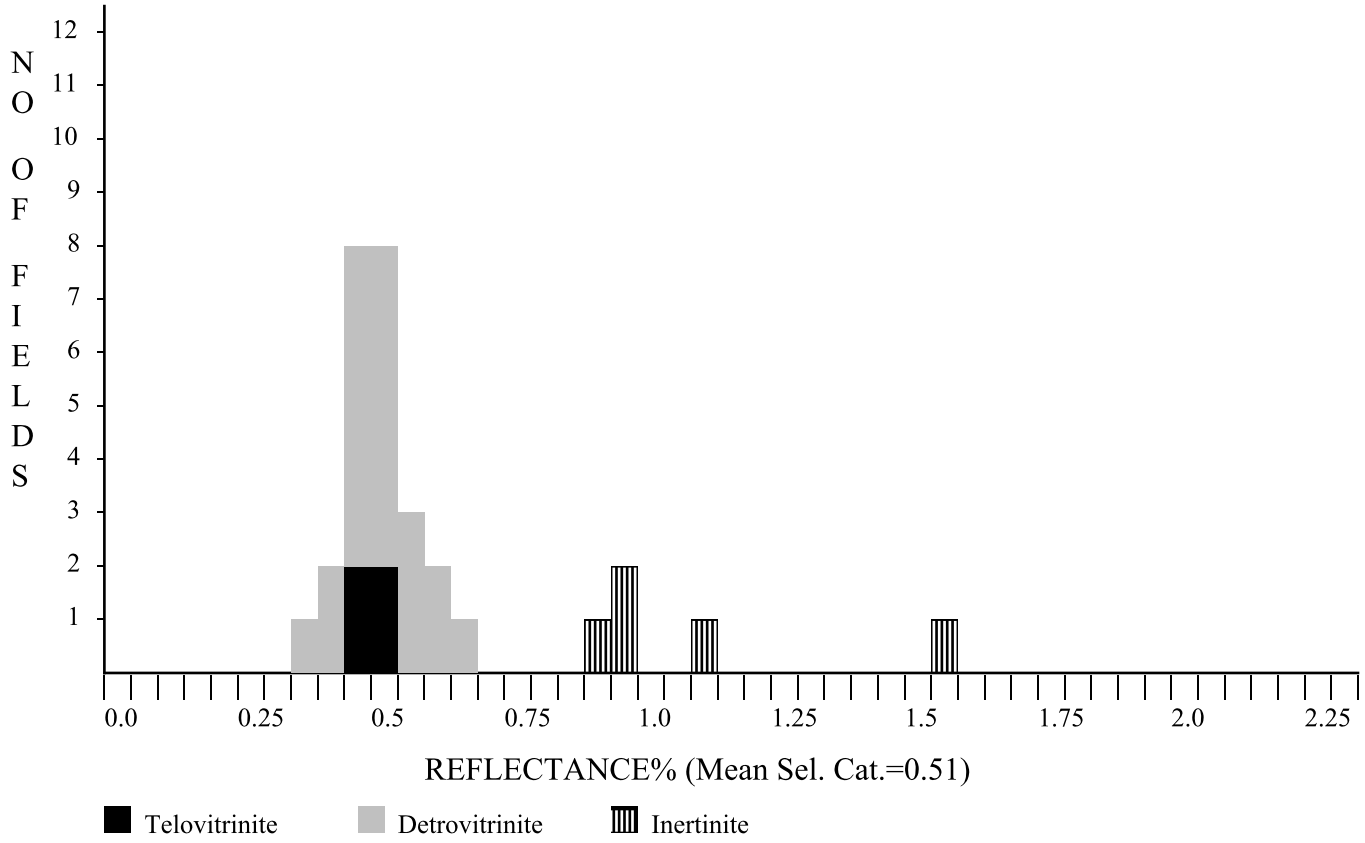
Sample Report, xxxx-3, Ctgs(E9999)



Maceral Category	N	Mean	Standard Deviation
Telovitrinite	4	0.48	0.021
Detrovitrinite	21	0.51	0.069
Inertinite	5	1.11	0.247
Total	30	0.61	0.254

Selected categories: Telovitrinite,Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.51
Standard Deviation of Selected categories:	0.065

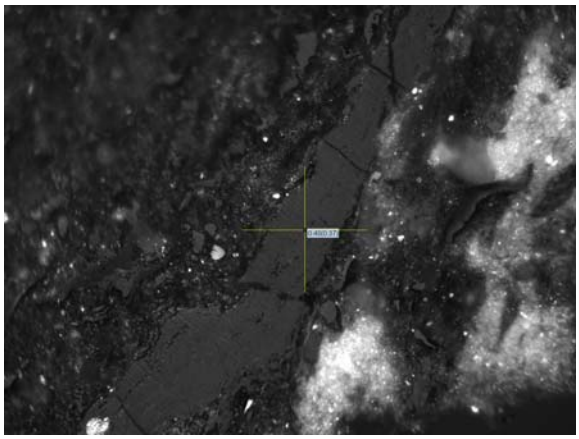
Dr Peter Crosdale (MAIG)
Director, ERC
1st April 2050

APPENDIX - PLATES

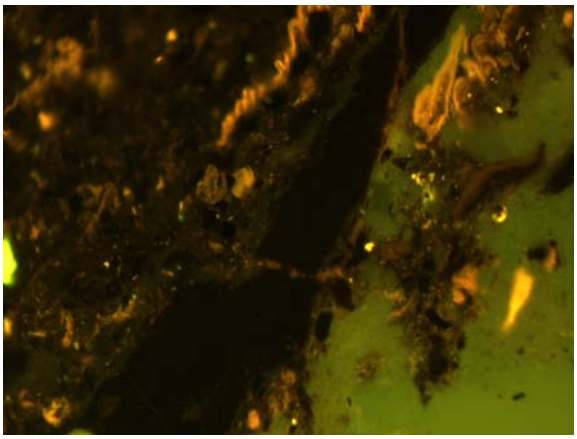
High quality images are provided in a separate image file. Images provided in this report are for reference purposes only.

E9997A Vitrinite in shaly coal, Rv max=0.48%, reflected white light, X50
E9997B Same as E0101A, in fluorescence mode
E9997C Cross section of a leaf with cutinite and remnants of epidermal cells, fluorescence mode, X50
E9998A Detrovitrinite in claystone, Rv max=0.53%, reflected white light, X50
E9998B Same as E0102A, in fluorescence mode

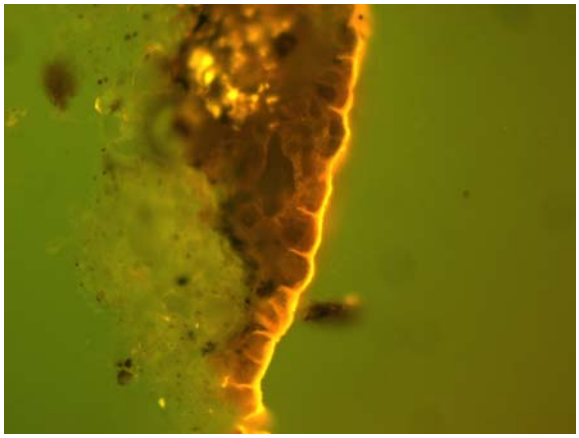
E9998C Shaly coal of clarite composition, Rv max=0.55%, reflected white light, X50
E9998D Same as E0102C, in fluorescence mode
E9999A Clarite coal, Rv max=0.0.50%, reflected white light, X50
E9999B Same as E0103A, in fluorescence mode
E9999C Detrovitrinite in siltstone, Rv max=0.56%, reflected white light, X50



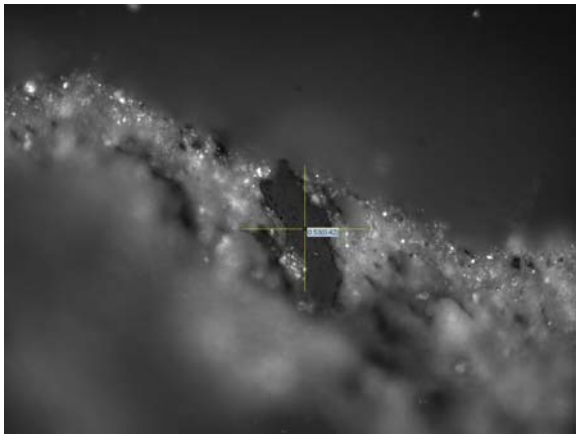
E9997A Vitrinite in shaly coal, Rv max=0.48%, reflected white light, X50



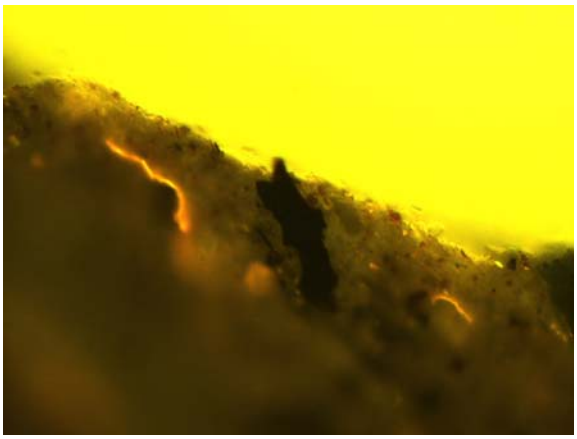
E9997B Same as E0101A, in fluorescence mode



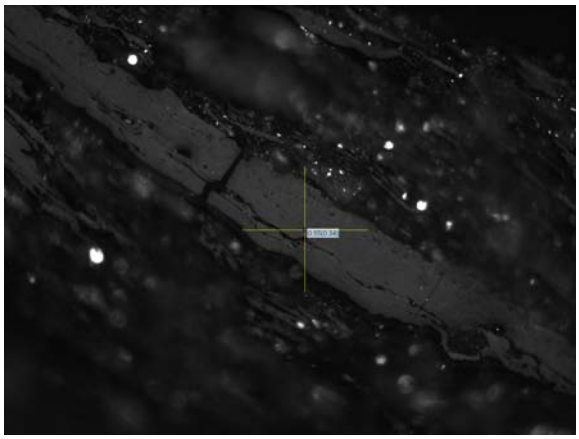
E9997C Cross section of a leaf with cutinite and remnants of epidermal cells, fluorescence mode, X50



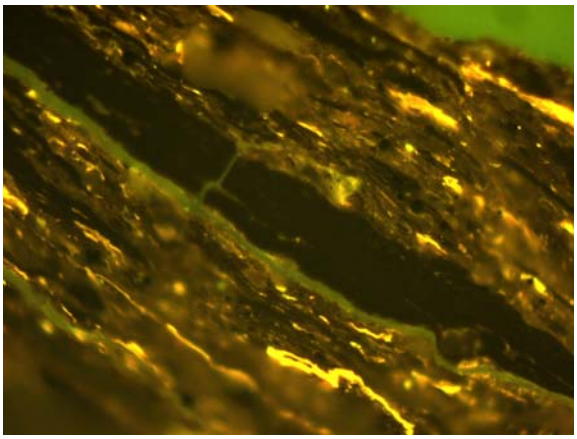
E9998A Detrovitrinite in claystone, Rv max=0.53%, reflected white light, X50



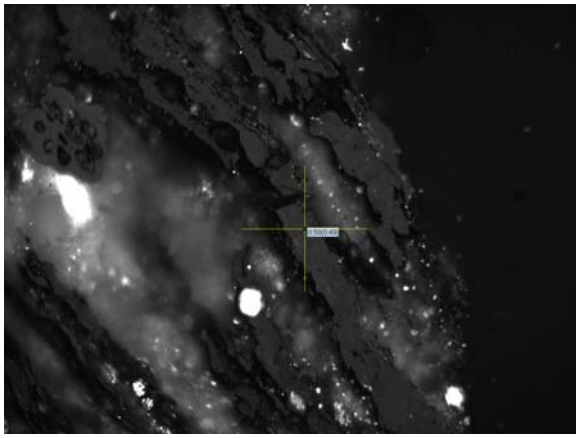
E9998B Same as E0102A, in fluorescence mode



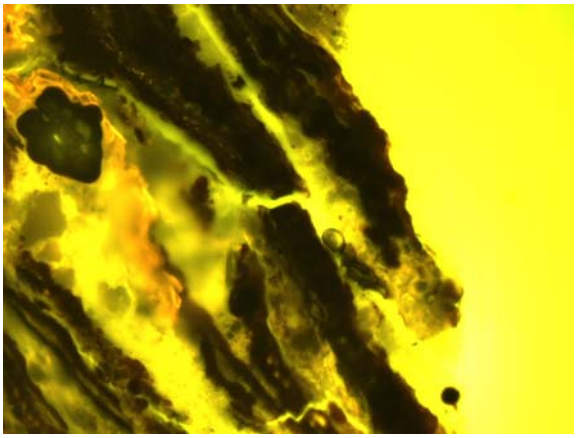
E9998C Shaly coal of clarite composition, Rv max=0.55%, reflected white light, X50



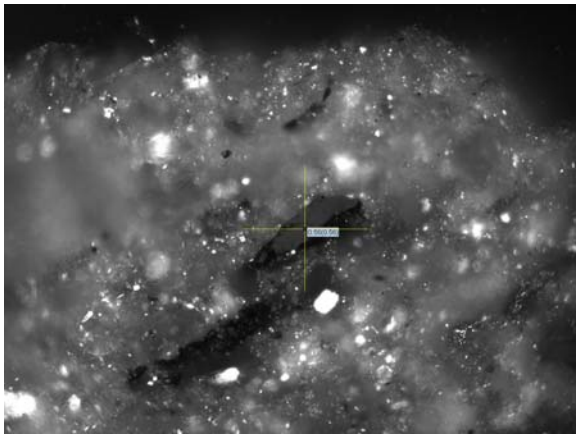
E9998D Same as E0102C, in fluorescence mode



E9999A Clarite coal, Rv max=0.0.50%, reflected white light, X50



E9999B Same as E0103A, in fluorescence mode



E9999C Detrovitrinite in siltstone, Rv max=0.56%, reflected white light, X50