

ANALYTICAL REPORT

SOURCE ROCK ORGANIC MATTER REFLECTANCE AND TYPING

BMR KENNEDY RANGE

PREPARED FOR GEOLOGICAL SURVEY AND RESOURCE STRATEGY DIVISION DMIRS

SEPTEMBER 2021



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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. If HAWK pyrolysis was also requested, the equivalent sample number is also indicated. HAWK data are reported separately.

ERC Sample No.		Company Reference	Sample Type	Other information
V _r	HAWK			
E4439		237754	Cuttings	1080 - 85 ft
E4440		237755	Cuttings	1140 - 50 ft
E4441		237758	Cuttings	1800 - 05 ft

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 through 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)	R_{Vmax}^{*1}	Range ^{*2}	SD ^{*3}	N ^{*4}
x1234	3106	0.79	0.64 - 0.91	0.145	25
	R_I^{*5}				
	Alginite ^{*5}				
	Bitumen ^{*5}				

*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)

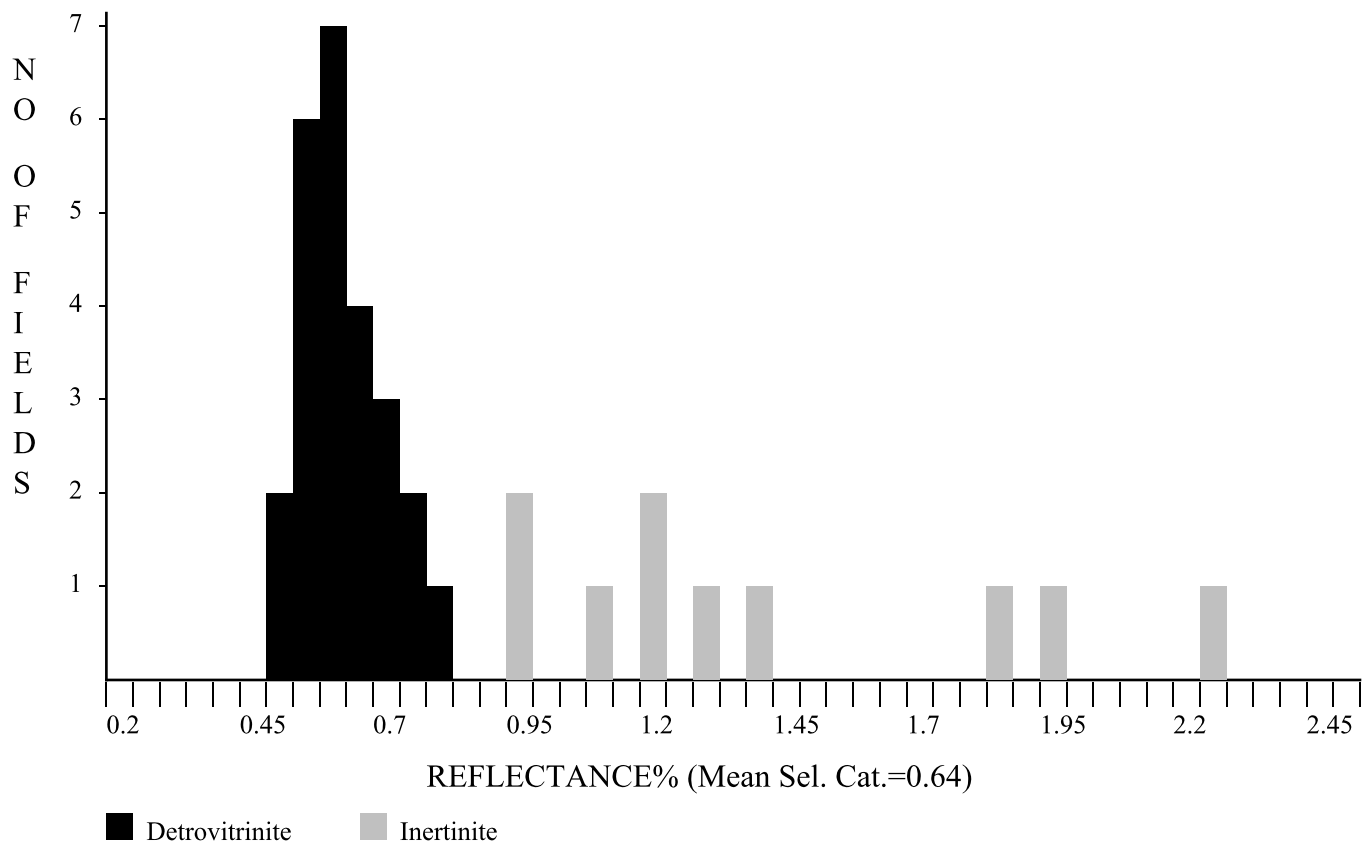
*5 Reflectance of multiple vitrinite populations or of other organic matter types. R_I = Inertinite mean maximum reflectance etc; subscripts may be expanded as necessary.

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.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA						
Sample# Client ref.	Depth (ft)	\overline{R}_{vmax}	Range	SD	N	Sample description including liptinite fluorescence, maceral abundances, mineral fluorescence BMR KENNEDY RANGE GSWA# 237754
E4439	1080-1085	0.64	0.52-0.81	0.079	25	Common sporinite and rare liptodetrinite orange to dull orange, sparse cutinite orange dull orange. (Silty claystone> argillaceous siltstone>sandstone>carbonate. Dom abundant, I>>L>V. Inertinite abundant, liptinite common, vitrinite rare to sparse. Mineral fluorescence weak orange. Iron oxides sparse. Pyrite common.) GSWA# 237755
237754	\overline{R}_I	1.43	0.96-2.26	0.420	10	
Ctgs						
E4440	1140-1150	0.66	0.52-0.84	0.089	25	Common sporinite and rare liptodetrinite orange to dull orange, sparse cutinite orange dull orange. (Argillaceous siltstone>sandstone>carbonate. Dom abundant, I>>L>V. Inertinite abundant, liptinite common, vitrinite rare. Mineral fluorescence weak orange. Iron oxides sparse. Pyrite abundant.) GSWA# 237758
237755	\overline{R}_I	1.64	1.07-3.65	0.709	10	
Ctgs						
E4441	1800-1805	0.70	0.56-0.87	0.080	25	Abundant sporinite and rare liptodetrinite orange to dull orange, sparse cutinite orange dull orange. (Silty claystone> siltstone>sandstone>carbonate. Dom abundant, I>L>V. Inertinite and, liptinite abundant, vitrinite rare. Mineral fluorescence weak orange. Iron oxides sparse. Pyrite common.)
237758	\overline{R}_I	1.49	1.20-1.92	0.227	10	
Ctgs						

GSWA, 237754, BMR Kennedy Range, 1080-1085ft, Ctgs(E4439)

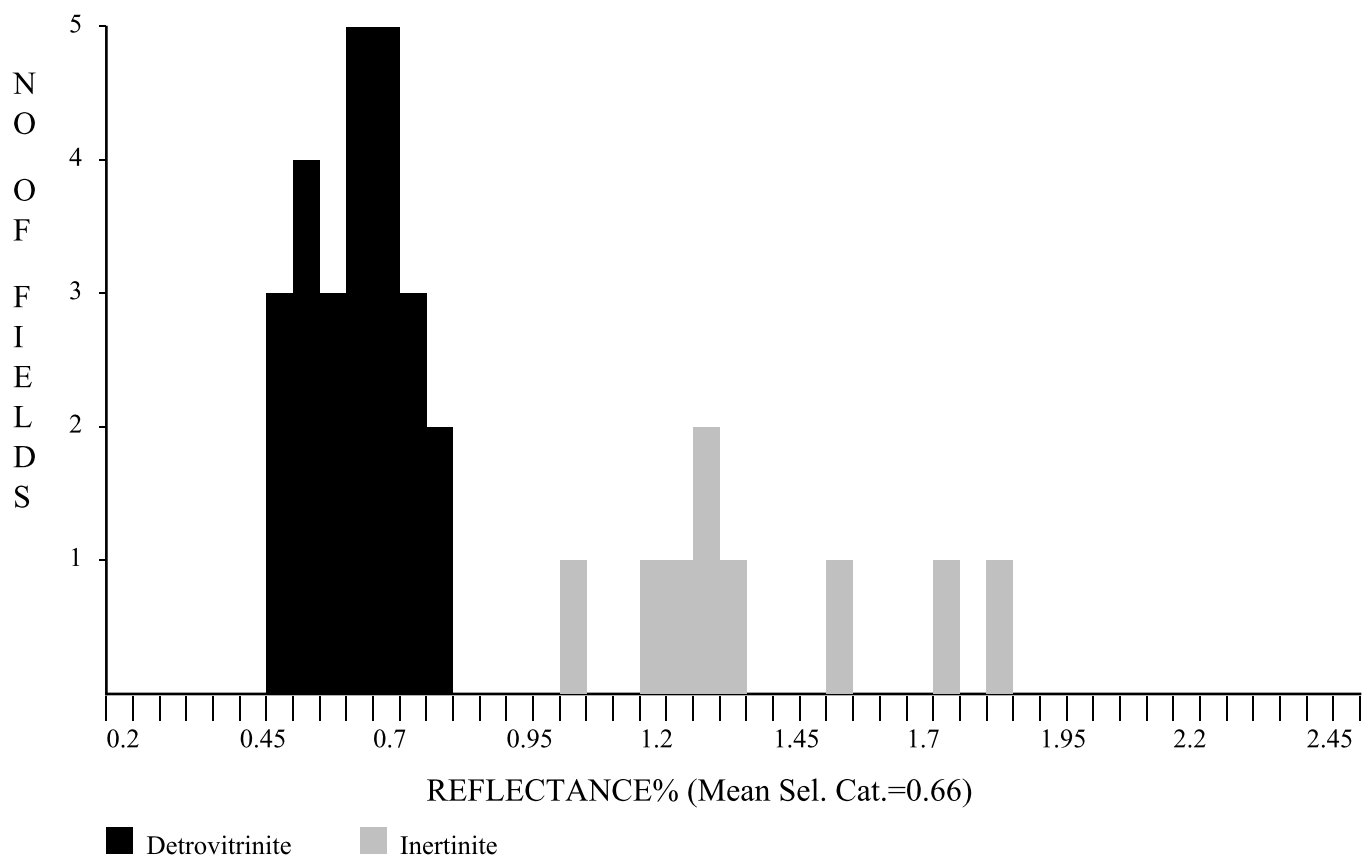


Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	25	0.64	0.079
Inertinite	10	1.43	0.420
Total	35	0.87	0.428

Selected categories: Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.64
Standard Deviation of Selected categories:	0.079

GSWA, 237755, BMR Kennedy Range, 1140-1150ft, Ctgs(E4440)

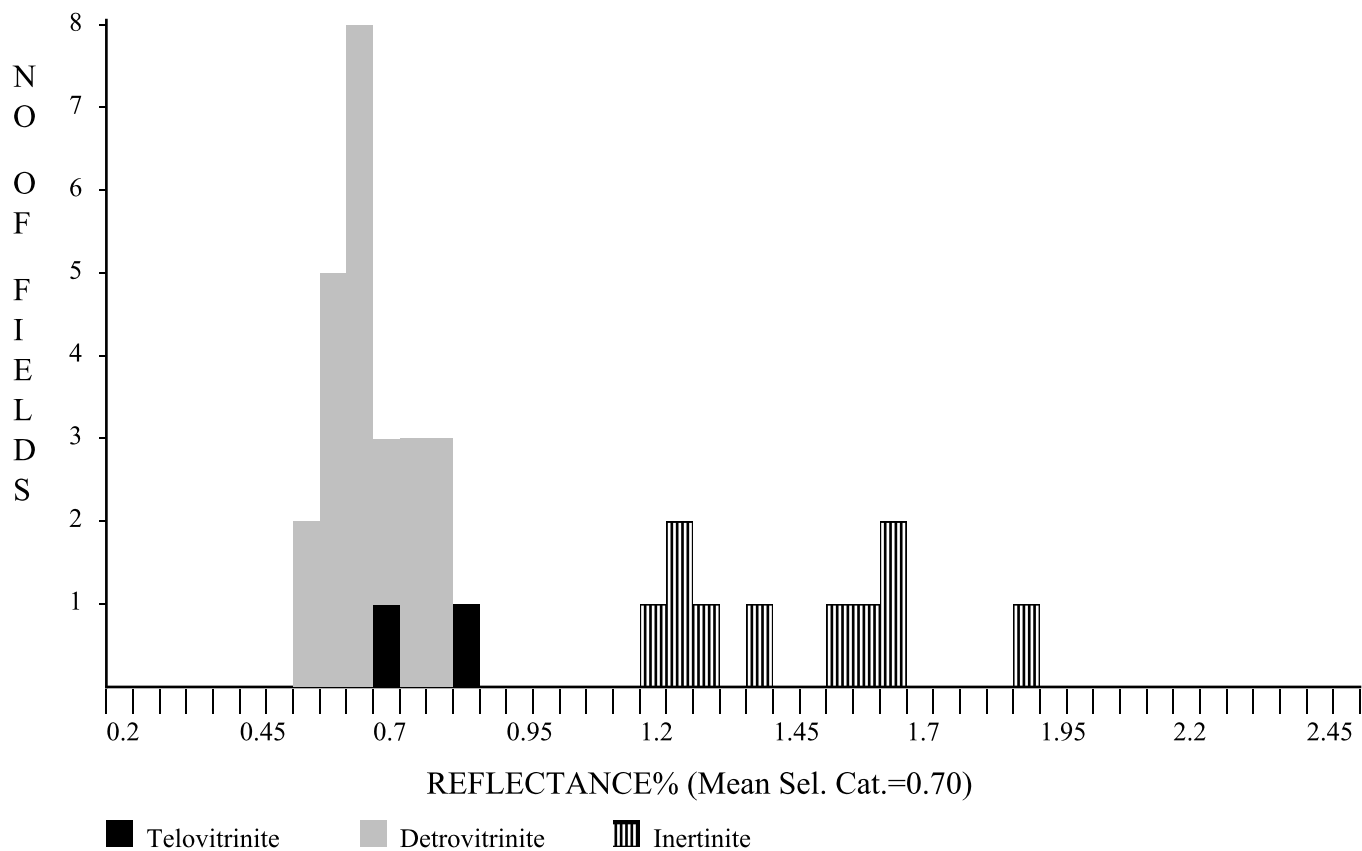


Maceral Category	N	Mean	Standard Deviation
Detrovitrinite	25	0.66	0.089
Inertinite	10	1.64	0.709
Total	35	0.94	0.586

Selected categories: Detrovitrinite:

No. of Readings:	25
Mean of Selected Categories:	0.66
Standard Deviation of Selected categories:	0.089

GSWA, 237758, BMR Kennedy Range, 1800-1805ft, Ctgs(E4441)



Maceral Category	N	Mean	Standard Deviation
Telovitrinite	2	0.80	0.075
Detrovitrinite	23	0.69	0.075
Inertinite	10	1.49	0.227
Total	35	0.92	0.385

Selected categories: Telovitrinite, Detrovitrinite:

No. of Readings: 25
Mean of Selected Categories: 0.70
Standard Deviation of Selected categories: 0.080

Dr Peter Crosdale (MAIG)
Director, ERC
29th September, 2021

APPENDIX - PLATES

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

E4439A Detrovitrinite in silty claystone, $R_{v\max} = 0.61\%$, reflected white light, X50

E4439B Same as E4439A, in fluorescence mode

E4439C Sporinite in silty claystone, reflected white light, X50

E4439D Same as E4439C, in fluorescence mode

E4440A Detrovitrinite in argillaceous siltstone, $R_{v\max} = 0.62\%$, reflected white light, X50

E4440B Same as E4440A, in fluorescence mode

E4440C Sporinite in silty claystone, reflected white light, X50

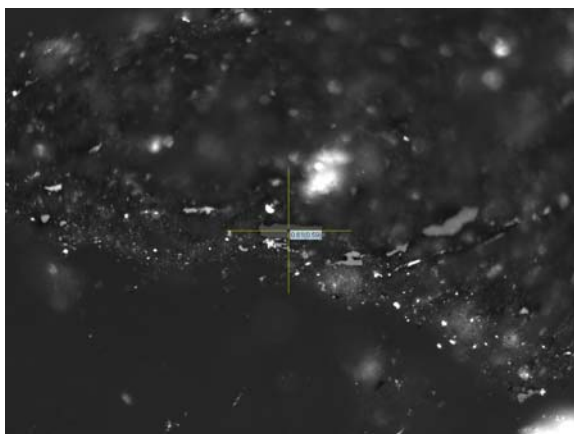
E4440D Same as E4440C, in fluorescence mode

E4441A Telovitrinite in silty claystone, $R_{v\max} = 0.87\%$, reflected white light, X50

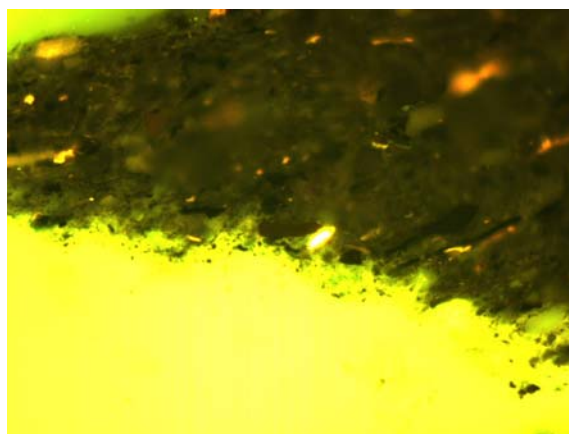
E4441B Same as E4441A, in fluorescence mode

E4441C Abundant sporinite in silty claystone, reflected white light, X50

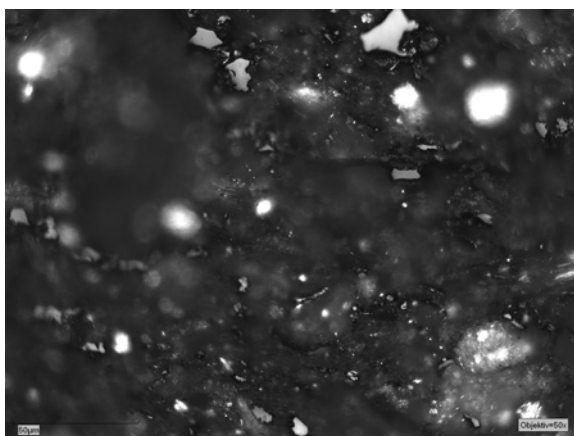
E4441D Same as E4441C, in fluorescence mode



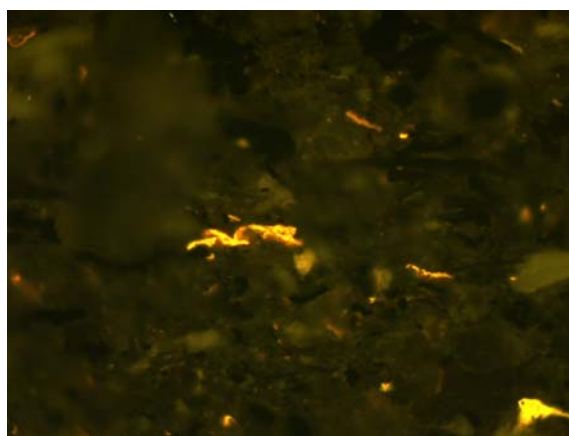
E4439A Detrovitrinite in silty claystone, $R_{v\max} = 0.61\%$, reflected white light, X50



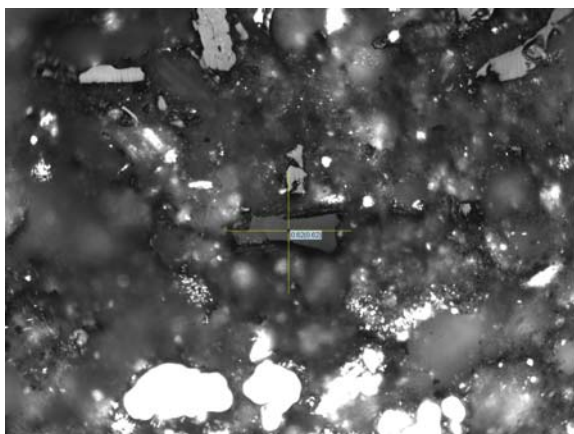
E4439B Same as E4439A, in fluorescence mode



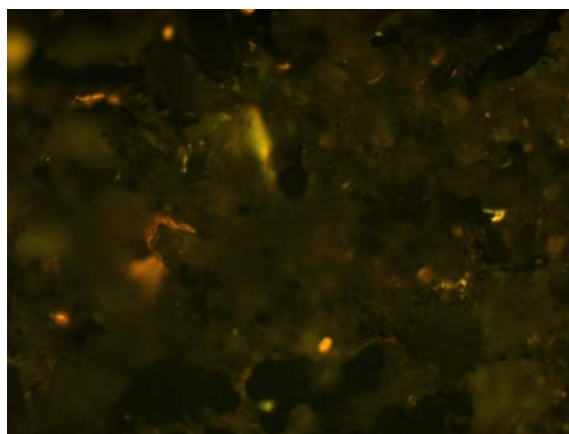
E4439C Sporinite in silty claystone, reflected white light, X50



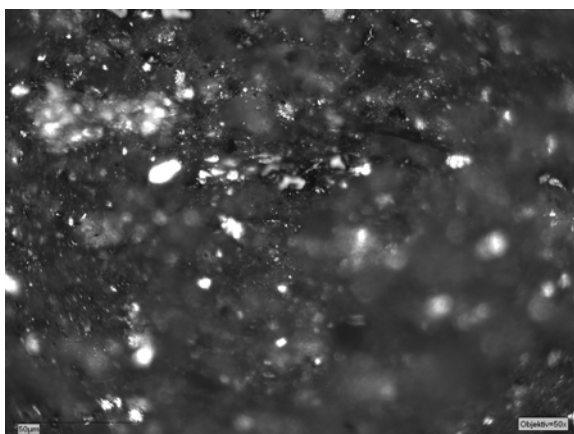
E4439D Same as E4439C, in fluorescence mod



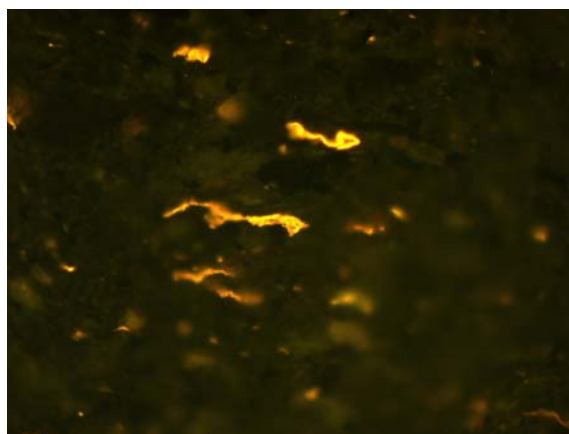
E4440A Detrovitrinite in argillaceous siltstone, $R_{v\max} = 0.62\%$, reflected white light, X50



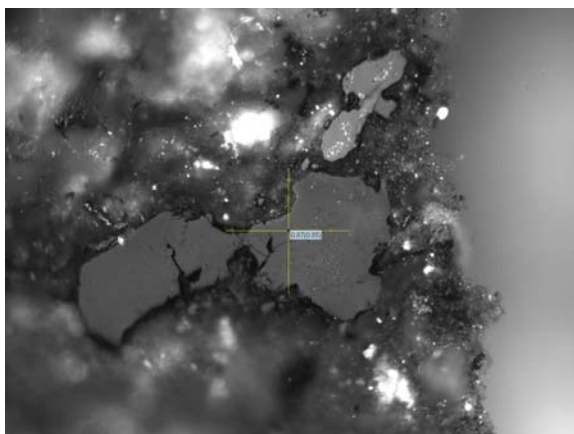
E4440B Same as E4440A, in fluorescence mode



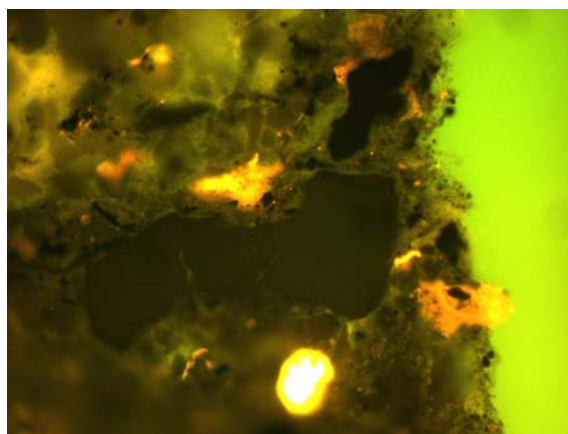
E4440C Sporinite in silty claystone, reflected white light, X50



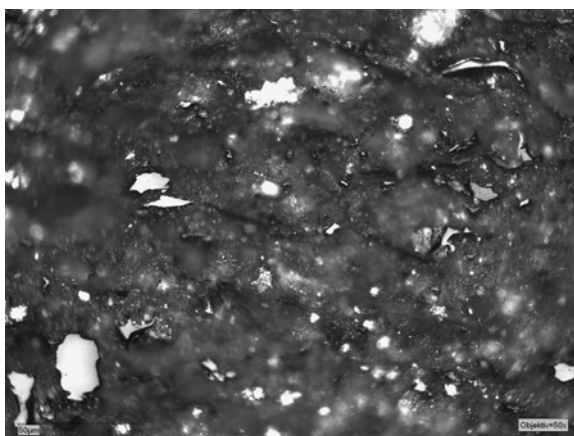
E4440D Same as E4440C, in fluorescence mode



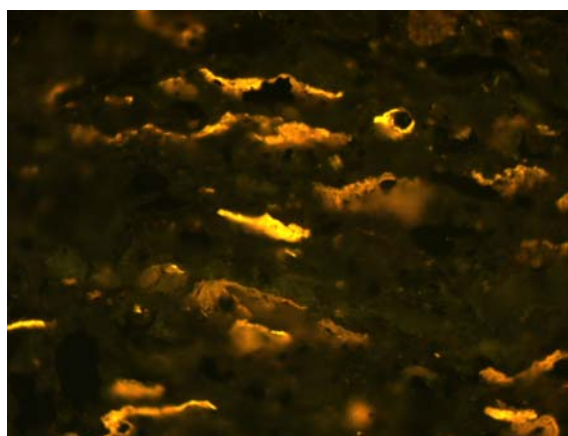
E4441A Telovitrinite in silty claystone, $R_{\text{max}} = 0.87\%$, reflected white light, X50



E4441B Same as E4441A, in fluorescence mode



E4441C Abundant sporinite in silty claystone, reflected white light, X50



E4441D Same as E4441C, in fluorescence mode