



EP/S/EXP/GDP N° 91/217.RP

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Well 25/2-14 (Norway) Organic geochemical and optical studies

EP/S/EXP/GDP N° 91/217.RP

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1. Optical study of the organic matter in reflectance fluorescence

The optical study of organic matter has been carried out on twenty-three samples taken over the Jurassic section between 3080 m and 3615 m including twelve core samples, four sidewall core samples and seven cutting samples. The analytical results are presented in annexes 1 to 23.

In addition to the normal nature-maturation study, maceral and microlithotype analysis was carried out on the coal samples

2. Screening organic geochemistry

2.1. Introduction

The organic geochemical screening study aims at assessing the source rock potential of shales and coals as well as the content and composition of the migrated hydrocarbons

Analytical results are listed in Tables 3, 4 and 5. The main geochemical parameters related to total organic carbon, Rock-Eval pyrolysis and solvent extracted organic matter are logged in Figures 5 and 6 and cross-plotted in Figures 7, 8 and 9.

TABLE 1 ORGANIC MATTER PETROGRAPHY

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Nature and relative abundance of fluorescent organic matter

Sample depth (M)	Fluoresc. vitrinite	Fluoresc. bitumen	Exsudatinitite	Fluorinite	Resinite	Sporinite	Cutinite	Plant tissues	Organic groundmass	Tasmanacea	Botryococcus	Dinoflagellates	Alginite
3080.00	■	■				■	■		■	■			■
3100.00	■	■				■	■		■	■	■		■
3134.03									■				
3135.00		■							■	■			
3164.24-3164.28				■	■	■	■						
3205.00						■	■		■				
3237.50						■			■				
3252.50						■			■				
3273.80						■			■				
3350.00						■	■		■	+	■		
3435.00	■	+				■	■		■	+	■		
3530.00	■				■	■	■				+		
3610.00-3615.00	■					+	■		■		■		

LEGEND: + = very rare; ■ = rare; ■ = common; ■ = frequent; ■ = abundant; ■ = very abundant; * = oil occurrence (column 0)

TABLE 2 : 25/2-14

MATURITY ASSESSMENT

Lab. Ref.	Sample Type	Depths : Metres	Nb. Readings	VRo% (mean)	Std. Dev.	eq VRo% Fluo.	
B41997	ND	3080	15	0.52	0.7	0.50-0.55 0.55	
B41998	ND	3100	24	0.41*	0.4		
B40472	CA	3134.03	30	0.55	0.2	0.50-0.55 0.55	
B41999	ND	3135	30	0.53	0.4		
B40473	CA	3135.25	30	0.56	0.3		
B40474	CA	3135.36	30	0.58	0.2		
B40475	CA	3153.96	30	0.56	0.3		
B40476	CA	3156.93	30	0.54	0.2		
B40477	CA	3157.10	30	0.51	0.2		
B40478	CA	3157.66	30	0.60	0.2		
B40479	CA	3157.69-3157.87	30	0.55	0.3		
B40480	CA	3164.04-3164.12	30	0.59	0.3		
B40481	CA	3164.12-3164.16	30	0.63	0.3		
B40482	CA	3164.16-3164.24	30	0.55	0.3		
B40483	CA	3164.24-3164.28	30	0.57	0.4		
B39884	CL	3205.00	30	0.63	0.4		
B40484	CL	3237.50	30	0.58	0.4		
B40485	CL	3252.50	30	0.69	0.4		
B40486	CL	3273.80	30	0.69	0.4		
B42000	ND	3350	30	0.70	0.5		0.75
B42001	ND	3435	30	0.70	0.6		
B42002	ND	3550	30	0.68*	0.5		
B42003	ND	3610-3615	30	0.67*	0.5	0.80	

* = Fluorescent Vitrinite

DESCRIPTION OF ANALYSED SAMPLES AND ORGANIC CARBON CONTENT

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	IR %	TOC %	IOC %	L I T H O L O G Y
B39880	CL	3060.00		5.73		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39881	CL	3070.00		5.98		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39882	CL	3076.00		6.89		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39883	CL	3090.00		4.47		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39700	CA03	3130.20		2.59		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39701	CA03	3131.70		1.86		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39702	CA03	3132.65		3.14		SHALE, DARK GREY, SILTY, MICROMICACEOUS
B39703	CA03	3133.95		.25		SANDSTONE, VERY FINE/FINE, MICROMICACEOUS
B39704	CA03	3134.80		.38		SANDSTONE, VERY FINE/FINE, MICROMICACEOUS
B39705	CA03	3135.85		.17		SANDSTONE, VERY FINE, MICROMICACEOUS
B39706	CA03	3136.80		.11		SANDSTONE, VERY FINE, MICROMICACEOUS
B39707	CA03	3137.60		.08		SANDSTONE, VERY FINE, MICROMICACEOUS
B39708	CA03	3138.70		.18		SANDSTONE, VERY FINE, MICROMICACEOUS
B39709	CA03	3139.80		.06		SANDSTONE, VERY FINE, MICROMICACEOUS
B39710	CA03	3140.60		.08		SANDSTONE, VERY FINE, MICROMICACEOUS
B39711	CA03	3141.55		.22		SANDSTONE, VERY FINE, MICROMICACEOUS
B39712	CA03	3142.75		.09		SANDSTONE, VERY FINE, MICROMICACEOUS
B39713	CA03	3143.60		.09		SANDSTONE, VERY FINE, MICROMICACEOUS
B39714	CA03	3144.35		.04		SANDSTONE, VERY FINE, MICROMICACEOUS, CALCAREOUS
B39715	CA03	3145.55		.05		SANDSTONE, VERY FINE, MICROMICACEOUS, CALCAREOUS
B39716	CA03	3146.45		.14		SANDSTONE, VERY FINE, MICROMICACEOUS
B39717	CA03	3147.35		.06		SANDSTONE, VERY FINE, MICROMICACEOUS
B39718	CA03	3148.60		.10		SANDSTONE, VERY FINE, MICROMICACEOUS
B39719	CA04	3149.60		.07		SANDSTONE, VERY FINE, MICROMICACEOUS
B39720	CA04	3150.60		.06		SANDSTONE, VERY FINE, MICROMICACEOUS
B39721	CA04	3151.45		.12		SANDSTONE, VERY FINE, MICROMICACEOUS
B39722	CA04	3152.75		.15		SANDSTONE, VERY FINE, MICROMICACEOUS, CALCAREOUS
B39723	CA04	3153.80		.25		SANDSTONE, VERY FINE, MICROMICACEOUS, CALCAREOUS
B39724	CA04	3154.65		.12		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39725	CA04	3155.75		.12		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39726	CA04	3156.60		.20		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39727	CA04	3157.60		.08		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39728	CA04	3158.70		.12		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39729	CA04	3159.60		.11		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39730	CA04	3160.50		.11		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39731	CA04	3161.30		.19		SANDSTONE, FINE, MICROMICACEOUS
B39732	CA04	3162.55		.04		SANDSTONE, FINE, MICROMICACEOUS
B39733	CA04	3162.75		37.69		COAL, BRITTLE
B39734	CA04	3163.50		.16		SANDSTONE, FINE, MICROMICACEOUS
B39735	CA04	3164.20		38.18		COAL
B39736	CA04	3164.40		10.91		COALY SHALE, LAMINATED, DENSE, MICROMICACEOUS
B39737	CA04	3164.95		7.15		COALY SHALE, LAMINATED, DENSE, MICROMICACEOUS
B39738	CA04	3165.85		.23		SANDSTONE, COARSE, MICROMICACEOUS
B39739	CA04	3166.95		.17		SANDSTONE, FINE/COARSE, MICROMICACEOUS
B39740	CA04	3167.70		.21		SANDSTONE, FINE/COARSE, MICROMICACEOUS

DESCRIPTION OF ANALYSED SAMPLES AND ORGANIC CARBON CONTENT

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	IR %	TOC %	IOC %	L I T H O L O G Y
B39884	CL	3205.00		62.17		COAL
B39885	CL	3378.00		1.13		SHALE, GREY, SILTY, MICROMICACEOUS
B39886	CL	3418.00		1.14		SHALE, GREY, SILTY, MICROMICACEOUS
B39887	CL	3435.00		1.30		SHALE, GREY, SILTY, MICROMICACEOUS
B39888	CL	3483.00		.61		SHALE, GREY, SILTY, MICROMICACEOUS
B39889	CL	3516.00		.76		SHALE, GREY, SILTY, MICROMICACEOUS

MINERALOGICAL COMPOSITION BY X-RAY DIFFRACTION

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	IR %	TOC %	IOC %	ALB %	ORT %	ANH %	QRZ %	CAL %	DOL %	SID %	ND %
B39880	CL	3060.00		5.73		1	0	0	22	1	1	0	75
B39881	CL	3070.00		5.98		1	0	1	21	0	3	0	74
B39882	CL	3076.00		6.89		1	0	0	24	0	1	0	74
B39883	CL	3090.00		4.47		2	1	1	19	4	3	0	70
B39700	CA03	3130.20		2.59		1	1	1	25	0	0	0	72
B39701	CA03	3131.70		1.86		1	2	2	27	0	0	0	68
B39702	CA03	3132.65		3.14		0	1	2	19	0	0	0	78
B39703	CA03	3133.95		.25		0	5	1	69	0	1	1	23
B39704	CA03	3134.80		.38		1	5	1	78	0	1	0	14
B39705	CA03	3135.85		.17		1	5	1	75	1	1	0	16
B39706	CA03	3136.80		.11		0	6	1	80	0	1	2	10
B39707	CA03	3137.60		.08		0	5	1	80	1	1	2	10
B39708	CA03	3138.70		.18		0	5	0	81	0	0	1	13
B39709	CA03	3139.80		.06		0	6	2	69	1	0	2	20
B39710	CA03	3140.60		.08		0	7	2	66	0	1	0	24
B39711	CA03	3141.55		.22		0	7	1	79	0	1	1	11
B39712	CA03	3142.75		.09		0	7	1	84	1	1	0	6
B39713	CA03	3143.60		.09		1	8	1	65	0	0	2	23
B39714	CA03	3144.35		.04		3	7	1	28	37	4	2	18
B39715	CA03	3145.55		.05		0	6	2	55	2	32	1	2
B39716	CA03	3146.45		.14		0	7	1	82	1	1	0	8
B39717	CA03	3147.35		.06		0	6	2	66	0	8	0	18
B39718	CA03	3148.60		.10		0	5	1	54	0	0	4	36
B39719	CA04	3149.60		.07		0	4	2	80	0	4	1	9
B39720	CA04	3150.60		.06		0	5	2	66	0	0	0	27
B39721	CA04	3151.45		.12		0	6	1	78	0	1	0	14
B39722	CA04	3152.75		.15		4	4	1	45	2	42	1	1
B39723	CA04	3153.80		.25		0	5	1	42	0	47	4	1
B39724	CA04	3154.65		.12		0	5	1	87	1	1	1	4
B39725	CA04	3155.75		.12		0	5	0	92	0	1	1	1
B39726	CA04	3156.60		.20		0	8	1	84	0	1	0	6
B39727	CA04	3157.60		.08		1	7	1	73	0	0	0	18
B39728	CA04	3158.70		.12		0	8	1	69	0	1	1	20
B39729	CA04	3159.60		.11		1	4	1	75	0	0	1	18
B39730	CA04	3160.50		.11		1	5	1	72	0	1	0	20
B39731	CA04	3161.30		.19		2	6	1	77	0	1	0	13
B39732	CA04	3162.55		.04		2	7	1	66	0	1	1	22
B39733	CA04	3162.75		37.69		0	0	0	1	0	0	0	99
B39734	CA04	3163.50		.16		1	2	1	62	5	0	4	25
B39735	CA04	3164.20		38.18		0	0	0	1	0	0	0	99
B39736	CA04	3164.40		10.91		1	0	0	13	0	1	1	84
B39737	CA04	3164.95		7.15		3	0	0	15	0	0	5	77
B39738	CA04	3165.85		.23		5	7	2	81	0	1	1	3
B39739	CA04	3166.95		.17		3	5	1	63	0	1	1	26
B39740	CA04	3167.70		.21		1	5	1	66	0	0	1	26

TABLE: 4 (Continued) 25/2-14

MINERALOGICAL COMPOSITION BY X-RAY DIFFRACTION

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	IR %	TOC %	IOC %	ALB %	ORT %	ANH %	QRZ %	CAL %	DOL %	SID %	ND %
B39884	CL	3205.00		62.17		0	0	0	1	0	0	0	99
B39885	CL	3378.00		1.13		2	0	2	23	0	0	2	71
B39886	CL	3418.00		1.14		3	0	5	21	1	0	4	66
B39887	CL	3435.00		1.30		4	0	4	29	0	0	2	61
B39888	CL	3483.00		.61		4	0	3	28	0	0	1	64
B39889	CL	3516.00		.76		3	1	2	13	0	0	3	78

TABLE: 5

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RESULTS OF ORGANIC INVENTORY ANALYSIS

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	R O C K - E V A L									EXTRACT ANALYSIS									
			Q1	on	Tmax	S1	S2	S3	PI	HI	OI	TOC	IOC	Q2	EOM	100(EOM/TOC)	SAT	ARO	POL	SAT/ARO	HC
B39880	CL	3060.00	N	RT	428	5.62	16.16	.55	.26	282	10	5.73		N	1.065	18.6	25.2	49.2	25.6	.51	7.92
B39881	CL	3070.00	N	RT	427	2.96	17.77	.48	.14	297	8	5.98		N	.553	9.3	17.0	44.1	38.8	.39	3.39
B39882	CL	3076.00	N	RT	428	2.55	24.91	.54	.09	362	8	6.89		N	.466	6.8	11.1	39.6	49.4	.28	2.36
B39883	CL	3090.00	N	RT	435	.69	5.56	1.06	.11	124	24	4.47		N	.093	2.1	17.3	27.5	55.2	.63	.42
B39700	CA03	3130.20	N	RT	431	.89	12.75	.06	.07	492	2	2.59		N	.183	7.1	13.1	38.5	48.4	.34	.94
B39701	CA03	3131.70	N	RT	435	.36	5.22	.26	.06	281	14	1.86		N	.121	6.5	12.4	36.5	51.1	.34	.59
B39702	CA03	3132.65	N	RT	434	.76	18.38	.27	.04	585	9	3.14		N	.225	7.2	23.8	43.2	33.1	.55	1.51
B39703	CA03	3133.95	N	RT	#	.04	.72	.96	.05	288	>170	.25		N	.027	11.0					
B39704	CA03	3134.80	N	RT	#	.14	2.45	.04	.05	645	11	.38		N	.030	7.8					
B39705	CA03	3135.85	N	RT	#	.16	1.23	.90	.12	724	>170	.17		N	.008	4.5					
B39706	CA03	3136.80	N	RT	#	.05	.71	.46	.07	645	>170	.11		N	.009	8.5					
B39707	CA03	3137.60	N	RT	#	.04	.52	.49	.07	650	>170	.08		N	.013	15.8					
B39708	CA03	3138.70	N	RT	#	.05	1.64	.12	.03	911	67	.18		N	.010	5.3					
B39709	CA03	3139.80	N	RT	#	<S	.26	.67		433	>170	.06		N	.008	13.0					
B39710	CA03	3140.60	N	RT	#	.04	.48	.19	.08	600	>170	.08		N	.012	14.9					
B39711	CA03	3141.55	N	RT	#	.04	1.67	.24	.02	759	109	.22		N	.007	3.1					
B39712	CA03	3142.75	N	RT	#	.03	.68	.26	.04	756	>170	.09		N	.014	15.1					
B39713	CA03	3143.60	N	RT	#	.04	.50	.51	.07	556	>170	.09		N	.011	12.1					
B39714	CA03	3144.35	N	RT	#	<S	.08	1.58	#	200	>170	.04		N	.014	35.0					
B39715	CA03	3145.55	N	RT	#	<S	.19	.82	#	380	>170	.05		N	.010	20.0					
B39716	CA03	3146.45	N	RT	#	.04	1.23	.28	.03	879	>170	.14		N	.010	7.2					
B39717	CA03	3147.35	N	RT	#	<S	.17	.35	#	283	>170	.06		N	.006	10.7					
B39718	CA03	3148.60	N	RT	#	.01	.09	.88	#	90	>170	.10		N	.005	5.1					
B39719	CA04	3149.60	N	RT	#	.02	.25	.37	.07	357	>170	.07		N	.007	9.4					
B39720	CA04	3150.60	N	RT	#	.03	.36	.11	.08	600	>170	.06		N	.010	16.8					
B39721	CA04	3151.45	N	RT	#	.06	.78	<S	.07	650		.12		N	.012	10.0					
B39722	CA04	3152.75	N	RT	#	<S	.10	1.18	#	67	>170	.15		N	.012	7.9					
B39723	CA04	3153.80	N	RT	#	.05	.18	1.10	#	72	>170	.25		N	.032	12.6	4.7	24.8	70.5	.19	.09
B39724	CA04	3154.65	N	RT	#	.04	1.11	.06	.03	925	50	.12		N	.008	6.9					
B39725	CA04	3155.75	N	RT	#	.03	1.13	<S	.03	942		.12		N	.004	3.4					
B39726	CA04	3156.60	N	RT	#	.89	.52	<S	.63	260		.20		N	.190	95.1	56.3	29.0	14.6	1.94	1.63
B39727	CA04	3157.60	N	RT	#	.07	.66	.05	.10	825	63	.08		N	.004	5.4					
B39728	CA04	3158.70	N	RT	#	.14	.95	<S	.13	792		.12		N	.005	4.3					
B39729	CA04	3159.60	N	RT	#	.08	.47	<S	.15	427		.11		N	.012	11.3					
B39730	CA04	3160.50	N	RT	#	.15	.76	<S	.16	691		.11		N	.007	6.2					
B39731	CA04	3161.30	N	RT	#	.16	1.11	.02	.13	584	11	.19		N	.013	7.1					
B39732	CA04	3162.55	N	RT	#	.08	.53	.26	.13	1325	>170	.04		N	.011	28.3					
B39733	CA04	3162.75	N	RT	435	24.84	154.04	1.50	.14	409	4	37.69		N	1.894	5.0	7.4	38.2	54.5	.19	8.63
B39734	CA04	3163.50	N	RT	#	.02	.25	.88	.07	156	>170	.16		N	.008	4.7					
B39735	CA04	3164.20	N	RT	436	24.00	182.32	1.52	.12	478	4	38.18		N	2.277	6.0	4.1	32.5	63.3	.13	8.35
B39736	CA04	3164.40	N	RT	431	2.86	34.02	.25	.08	312	2	10.91		N	.373	3.4	6.6	34.0	59.4	.19	1.51
B39737	CA04	3164.95	N	RT	433	1.76	20.63	.64	.08	289	9	7.15		N	.332	4.6	5.4	33.7	60.9	.16	1.30
B39738	CA04	3165.85	N	RT	#	.07	1.55	.08	.04	674	35	.23		N	.015	6.5					
B39739	CA04	3166.95	N	RT	#	.08	.74	.26	.10	435	153	.17		N	.012	6.8					
B39740	CA04	3167.70	N	RT	#	.14	1.03	.42	.12	490	>170	.21		N	.015	7.0					

TABLE: 5 (Continued) 25/2-14

RESULTS OF ORGANIC INVENTORY ANALYSIS

LAB. REF.	SAMPLE TYPE	DEPTHS Metres	R O C K - E V A L									EXTRACT ANALYSIS									
			Q1	on	Tmax	S1	S2	S3	PI	HI	OI	TOC	IOC	Q2	EOM	100(EOM/TOC)	SAT	ARO	POL	SAT/ARO	HC
B39884	CL	3205.00	N	RT	441	16.79	200.22	2.68	.08	322	4	62.17		N	1.587	2.6	3.8	31.3	64.8	.12	5.58
B39885	CL	3378.00	N	RT	439	.27	2.73	1.66	.09	242	147	1.13		N	.095	8.4	25.3	28.8	45.9	.88	.51
B39886	CL	3418.00	N	RT	438	.27	2.15	1.77	.11	189	155	1.14		N	.087	7.7	38.4	27.3	34.3	1.40	.57
B39887	CL	3435.00	N	RT	438	.28	3.01	1.12	.09	232	86	1.30		N	.101	7.7	33.9	29.1	37.0	1.16	.63
B39888	CL	3483.00	N	RT	#	.18	1.48	.80	.11	243	131	.61		N	.048	7.9	47.5	22.3	30.2	2.13	.34
B39889	CL	3516.00	N	RT	435	.19	1.25	1.26	.13	164	166	.76		N	.057	7.5	41.0	23.6	35.4	1.74	.37