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Title

STANDARD GEOCHEMICAL EVALUATION OF WELL 7128/4-1

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1 INTRODUCTION

This report presents the results of a standard geochemical evaluation of well 7128/4-1, PL 180, drilled in the Finnmark East area of the Barents Sea, offshore northern Norway (Fig. 1a). The well was drilled down to basement at 2530 mRKB after penetrating sediments of Quaternary, Triassic, Permian and Carboniferous age

This report includes the results from the standard study that was initiated after completion of the well and also contains the results of some analytical work that was carried out while the well was being drilled.

A total of 113 sediment samples, 5 gas samples and 6 fluid samples were analysed as described in the following analytical programme:

ANALYSES	NUMBER OF SAMPLES					
	cuttings	swc	core	fluid	gas	total
TOC		42	24			66
Rock Eval type pyrolysis		54	30			84
Vitrinite reflectance	14	14	3			31
Kerogen description		5	3			8
Pyrolysis GC		5	3			8
Solvent extraction		7	6			13
Iatroscan separation		7	6	6		19
MPLC separation		2	5	6		13
GC whole oil/extract		5	3	6		14
GC saturates		2	5	6		13
GC aromatics		2	5	6		13
GCMS saturates		2	5	6		13
GCMS aromatics		2	5	6		13
$\delta^{13}C$ of whole oil/extract +fractions		7	4	5		16
$\delta^{13}C$ of kerogen		2	3			5
$\delta^{13}C$ of gas components and gas composition					5	5
Fluid density (°API)				4		4

The analytical work was performed in accordance with the guidelines given in "The Norwegian Industry Guide to Organic Geochemical Analyses (1992)". The project was carried out at Statoil's Department of Geochemistry (all analyses except where specified) and Fluid Laboratories (API) with subcontracts to IFE (vitrinite reflectance measurements, visual kerogen description, all isotope analyses and gas analyses).

TABLE 1. SAMPLE TYPE, LITHOLOGY AND ANALYSES PERFORMED, WELL 7128/4-1

Depth (mRKB)	Sample no.	Sample type	Lithology	Screening	Follow-up analyses	Vitrinite refl.
769.50	S7863	swc	clst.	X		
820.50	ST1486	swc	clst.			X
890.00	ST1487	cutt	clst.			X
892.00	S7864	swc	clst.	X		
925.00	ST1488	swc	sst.			X
950.50	S7962	swc	sst.	X		
981.00	S7865	swc	sltst.	X		
1000.00	ST1489	cutt	sltst.			X
1029.00	S7866	swc	clst.	X		
1050.00	ST1490	cutt.	sltst.			X
1061.00	S7867	swc	clst.	X		
1092.50	ST1491	swc	clst.			X
1150.00	ST1492	cutt.	clst.			X
1210.00	ST1493	cutt.	clst.			X
1264.00	S7868	swc	clst.	X		
1270.00	ST1494	cutt	clst.			X
1281.00	S7869	swc	clst.	X		
1306.00	S7964	swc	sst.	X		
1323.50	S7870	swc	clst.	X		
1330.00	ST1495	cutt	clst.			X
1339.00	S7871	swc	clst.	X		
1390.00	ST1496	cutt	clst.			X
1399.00	S7872	swc	sltst.	X		
1410.00	S7873	swc	clst.	X		
1440.00	ST1497	cutt	clst.			X
1495.00	S7998	swc	sst.	X		
1500.00	ST1498	cutt	clst.			X
1536.00	S7965	swc	sst/sltst.	X		
1548.00	S7874	swc	sst.	X	X	
1555.00	S7875	swc	sltst.	X	X	
	ST1499					X
1557.00	S7876	swc	sltst.	X		

Depth (mRKB)	Sample no.	Sample type	Lithology	Screening	Follow-up analyses	Vitrinite refl.
1561.00	S7877	swc	sltst.	X		
1562.00	S7878	swc	sltst.	X		
1566.00	S7879	swc	sltst.	X	X	
1568.50	S7880	swc	sltst.	X	X	
1570.50	S7881	swc	ls.	X	X	
1571.50	S7882	swc	ls.	X	X	
1574.30	S7397	core	cht/spic.	X	X	
1574.60	S7398	core	cht/spic.	X	X	
1579.00	S7884	swc	cht/spic.	X		
1593.00	S7889	swc	cht/ls.	X		
1593.00	ST1500	cutt	cht.			X
1629.50	S7892	swc	ls.	X		
1629.50	S7893	swc	ls.	X		
1648.00	S7894	swc	sltst.	X		
1652.50	S7895	swc	sltst.	X		
1654.00	S7896	swc	sltst.	X		
1654.50	S7897	swc	sltst.	X		
1655.50	S7898	swc	sltst.	X		
	ST1501					X
1664.00	S7899	swc	sltst.	X		
1679.00	S7900	swc	sltst.	X	X	
1682.50	S7901	swc	sltst.	X		
1693.00	S7902	swc	sltst.	X		
1696.00	S8000	swc	ls.	X		
1698.00	ST1502	cutt	sltst.			X
1701.50	S7903	swc	sltst.	X		
1752.00	ST1503	cutt	ls.			X
1827.80	S7979	core	sh.	X		
	ST1504					X
1828.00	S7980	core	sh.	X		
1828.20	S7981	core	sh.	X		
1832.50	S7982	core	sh.	X		
1846.50	S7983	core	ls.	X		
1858.60	S7984	core	ls.	X		
	ST1505					X

Depth (mRKB)	Sample no.	Sample type	Lithology	Screening	Follow-up analyses	Vitrinite refl.
1911.00	S7904	swc	ls.	X		
1932.00	ST1506	cutt	ls.			X
1984.00	ST1507	swc	sltst.			X
2009.00	S7905	swc	sltst.	X	X	
2036.00	ST1508	swc	sltst.			X
2062.00	S7906	swc	clst.	X		
2072.00	S7907	swc	clst.	X		
2091.00	ST1509	swc	sltst.			X
2126.00	S7908	swc	sst.	X		
2130.00	S7909	swc	coal	X		
	ST1510					X
2152.00	S7910	swc	sst.	X		
2170.00	S7911	swc	coal	X		
	ST1511					X
2186.50	S7912	swc	sst.	X		
2216.00	ST1512	swc	sltst.			X
2257.00	S7913	swc	sltst.	X		
2286.00	S7914	swc	coal	X		
	ST1513					X
2311.00	S7915	swc	sltst.	X		
2316.50	S7916	swc	sltst.	X		
2342.00	S7917	swc	coal	X		
	ST1514					X
2362.25	S7985	core	sst.	X		
2363.50	S7986	core	sst.	X		
2364.90	ST1658	core	coal			X[1]
2366.18	S7963	core	coal	X		
2366.25	ST1659	core	coal			X[1]
2366.30	S7966	core	coal	X		
2366.42	S7967	core	coal	X		
2366.58	S7987	core	coal	X	X	
2366.74	S7968	core	coal	X		
2366.90	S7969	core	coal	X	X	
2367.00	S7970	core	coal	X		
2368.25	S7988	core	sst.	X		

Depth (mRKB)	Sample no.	Sample type	Lithology	Screening	Follow-up analyses	Vitrinite refl.
2368.70	ST1660	core	coal			X[1]
2375.60	S7989	core	sst.	X	X	
2375.95	S7971	core	coal	X		
2376.07	S7972	core	coal	X		
2376.19	S7973	core	coal	X		
2376.28	S7990	core	coal	X	X	
2376.39	S7974	core	coal	X		
2376.50	S7975	core	coal	X		
	ST1661					X[1]
2384.50	S7991	core	coal	X		
	ST1515					X
2384.60	S7976	core	coal	X		
2384.69	S7977	core	coal	X		
2384.75	ST1662	core	coal			X[1]
2384.77	S7978	core	coal	X		
2450.00	S7918	swc	coal	X	X	
	ST1516					X
2527.50	S7992	core	sst.	X		
1586.00	S7997	DST 2	oil+gas		X	
1610.00	S7995	DST 1A	oil+gas		X	
1610.00	S7996	DST 1A+1B	oil+gas		X	
1572.70	S7993	FMT	cond.+gas		X	
1576.00	S8392	FMT	oil+gas		X	
1588.80	S7994	FMT	oil+water		X	

[1] These samples were analysed independently of the standard geochemical study but are also reported here (see Table 3).

TABLE 2. TOC AND THA DATA FOR WELL 7281/4-1.

Depth m RKB	S. no	S1 < mg HC / g rock	S2 >	TOC wt %	HI mg HC/g TOC	PP mg HC/ g rock	PI	Tmax oC	Lithology
769,50	S7863	0,08	0,19	0,1	190	0,3	0,30	490	clst.
892,00	S7864	0,01	0,07	0,1	50	0,1	0,13	421	clst.
981,00	S7865	0,02	0,05	0,2	28	0,1	0,29	532	sltst.
1.029,00	S7866	0,01	0,03	0,1	30	0,0	0,25	544	clst.
1.061,00	S7867	0,03	0,05	0,1	45	0,1	0,38	554	clst.
1.264,00	S7868	0,03	0,11	0,2	61	0,1	0,21	429	clst.
1.281,00	S7869	0,02	0,07	0,2	44	0,1	0,22	402	clst.
1.323,50	S7870	0,03	0,12	0,3	48	0,2	0,20	412	clst.
1.339,00	S7871	0,02	0,11	0,2	69	0,1	0,15	423	clst.
1.399,00	S7872	0,03	0,04	0,2	17	0,1	0,43	403	sltst.
1.410,00	S7873	0,04	0,06	0,2	33	0,1	0,40	563	clst.
1.536,00	S7965	0,12	0,50	0,2	278	0,6	0,19	426	sst/sltst.
1.548,00	S7874	0,90	0,04	0,4	10	0,9	0,96	413	sst.
1.555,00	S7875	0,07	0,16	0,4	39	0,2	0,30	417	sltst.
1.557,00	S7876	0,07	0,17	0,4	39	0,2	0,29	422	sltst.
1.561,00	S7877	0,04	0,08	0,3	29	0,1	0,33	419	sltst.
1.562,00	S7878	0,05	0,10	0,3	29	0,2	0,33	410	sltst.
1.566,00	S7879	0,04	0,17	0,4	45	0,2	0,19	418	sltst.
1.568,50	S7880	0,04	0,14	0,2	78	0,2	0,22	416	sltst.
1.648,00	S7894	0,08	0,05	0,3	18	0,1	0,62	365	sltst.
1.652,50	S7895	0,06	0,02	0,3	8	0,1	0,75	410	sltst
1.654,00	S7896	0,11	0,03	0,3	12	0,1	0,79	381	sltst
1.654,50	S7897	0,10	0,14	0,4	39	0,2	0,42	429	sltst
1.655,50	S7898	0,15	0,41	1,0	42	0,6	0,27	432	sltst
1.664,00	S7899	0,05	0,03	0,2	14	0,1	0,63	399	sltst
1.679,00	S7900	0,88	3,2	1,9	166	4,1	0,22	436	sltst
1.682,50	S7901	0,14	0,13	0,4	37	0,3	0,52	430	sltst
1.693,00	S7902	0,14	0,33	0,7	49	0,5	0,30	434	sltst
1.696,00	S8000	0,35	0,22	0,5	41	0,6	0,61	424	ls
1.701,50	S7903	0,21	0,36	0,9	41	0,6	0,37	443	sltst
1.827,80	S7979	0,03	0,05	0,3	15	0,1	0,38	415	sh
1.828,00	S7980	0,03	0,01	0,3	3	0,0	0,75	431	sh
1.828,20	S7981	0,03	0,03	0,3	10	0,1	0,50	423	sh
1.832,50	S7982	0,04	0,05	0,6	9	0,1	0,44	404	sh
1.846,50	S7983	0,02	0,05	0,1	83	0,1	0,29	375	lst.
1.858,60	S7984	0,02	0,06	0,2	35	0,1	0,25	373	lst.
1.911,00	S7904	0,03	0,04	0,2	21	0,1	0,43	339	lst.
2.009,00	S7905	0,14	0,53	1,2	46	0,7	0,21	440	sltst.
2.062,00	S7906	0,02	0,13	0,1	93	0,2	0,13	512	clst.
2.072,00	S7907	0,02	0,14	0,2	78	0,2	0,13	511	clst.
2.130,00	S7909	13,4	214,3	82,1	261	227,7	0,06	451	coal
2.170,00	S7911	1,8	30,1	15,0	201	31,9	0,05	449	coal
2.257,00	S7913	0,43	2,1	2,5	84	2,5	0,17	444	sltst.
2.286,00	S7914	17,5	164,7	81,5	202	182,3	0,10	446	coal
2.311,00	S7915	0,72	3,7	3,4	108	4,4	0,16	452	sltst.
2.316,50	S7916	0,74	3,9	3,3	117	4,6	0,16	447	sltst.

TABLE 2. TOC AND THA DATA FOR WELL 7281/4-1.

Depth m RKB	S. no	S1 < mg HC / g rock	S2 >	TOC wt %	HI mg HC/g TOC	PP mg HC/ g rock	PI	Tmax oC	Lithology
2.342,00	S7917	21,8	191,5	80,9	237	213,3	0,10	443	coal
2.366,18	S7963	13,0	261,4	81,3	322	274,5	0,05	445	coal
2.366,30	S7966	16,5	249,0	81,8	304	265,5	0,06	439	coal
2.366,42	S7967	16,4	179,2	81,4	220	195,5	0,08	453	coal
2.366,58	S7987	16,3	273,4	79,3	345	289,7	0,06	449	coal
2.366,74	S7968	14,7	240,1	82,3	292	254,8	0,06	442	coal
2.366,90	S7969	11,6	125,6	53,1	237	137,2	0,08	446	coal
2.367,00	S7970	18,2	247,4	80,3	308	265,7	0,07	446	coal
2.375,95	S7971	1,4	25,2	8,8	285	26,7	0,05	450	coal
2.376,07	S7972	9,1	121,7	62,0	196	130,8	0,07	451	coal
2.376,19	S7973	15,3	198,8	72,9	273	214,1	0,07	449	coal
2.376,28	S7990	13,6	108,3	83,1	130	121,9	0,11	452	coal
2.376,39	S7974	15,1	128,9	66,8	193	144,1	0,11	455	coal
2.376,50	S7975	20,0	150,8	79,2	190	170,8	0,12	452	coal
2.384,50	S7991	16,5	221,3	78,2	283	237,9	0,07	448	coal
2.384,60	S7976	18,4	173,7	80,8	215	192,2	0,10	456	coal
2.384,69	S7977	16,5	194,1	81,8	237	210,6	0,08	449	coal
2.384,77	S7978	12,6	126,3	55,5	228	138,9	0,09	448	coal
2.450,00	S7918	17,1	312,8	81,1	386	329,8	0,05	444	coal
2.527,50	S7992	0,02	0,04	0,2	22	0,1	0,33	354	sst.
950,50	S7962	0,02	0,08			0,1	0,20	401	sst.
1.306,00	S7964	0,04	0,05			0,1	0,44	561	sst.
1.495,00	S7998	0,08	0,03			0,1	0,73	340	sst.
1.570,50	S7881	0,37	0,06			0,4	0,86	428	ls.
1.571,50	S7882	1,6	0,11			1,7	0,94	326	ls.
1.574,30	S7397	4,3	0,11			4,5	0,98	19	cht/spic.
1.574,60	S7398	2,7	0,11			2,8	0,96	19	cht/spic.
1.579,00	S7884	13,4	0,06			13,5	1,00	326	cht/spic.
1.593,00	S7889	9,0	0,04			9,1	1,00	326	cht/ls.
1.629,50	S7892	0,09	0,03			0,1	0,75	326	ls.
1.629,50	S7893	0,11	0,06			0,2	0,65	418	ls.
2.126,00	S7908	0,08	0,06			0,1	0,57	403	sst.
2.152,00	S7910	0,06	0,11			0,2	0,35	436	sst.
2.186,50	S7912	0,07	0,04			0,1	0,64	428	sst.
2.362,25	S7985	0,02	0,03			0,1	0,40	365	sst.
2.363,50	S7986	0,02	0,07			0,1	0,22	373	sst.
2.368,25	S7988	0,03	0,04			0,1	0,43	357	sst.
2.375,60	S7989	0,16	0,68			0,8	0,19	451	sst.
Standards									
BVM		0,47	18,8					419	
BVM		0,47	17,2					421	
BVM		0,48	18,6					422	
BVM		0,45	19,5					421	
BVM		0,49	18,2					420	

TABLE 2. TOC AND THA DATA FOR WELL 7281/4-1.

Depth m RKB	S. no	S1 < mg HC / g rock	S2 >	TOC wt %	HI mg HC/g TOC	PP mg HC/ g rock	PI	Tmax oC	Lithology
BVM		0,48	18,2					422	
BVM		0,46	17,1					421	
BVM		0,48	17,8					423	
BVM		0,50	17,4					420	
BVM		0,44	18,7					420	
BVM		0,46	19,8					421	
BVM		0,48	20,1					415	
BVM		0,45	19,0					416	
BVM				4,3					
BVM				4,4					
BVM				4,3					
BVM				4,3					
BVM				4,3					
BVM				4,4					
BVM				4,2					
BVM				4,4					
BVM				4,3					

TABLE 3. VITRINITE REFLECTANCE DATA, WELL 7128/4-1
(measured by IFE, see Appendix 1)

IFE no.	Depth, mRKB	Sample type	Lithology	%Rm	Std. dev.	N	Quality	Preparation
ST 1486	820.5	swc	sandstone	0.34	0.08	10	P	HF
ST 1487	890	cut	claystone	0.43	0.07	19	P	HF
ST 1488	925	swc	sandstone	0.39	0.03	7	P	HF
ST 1489	1000	cut	clst/sst	-	-	-	barren	HF
ST 1490	1050	cut	claystone	0.37	0.05	8	P	HF
ST 1491	1092.5	swc	claystone	-	-	-	barren	HF
ST 1492	1150	cut	claystone	0.49	0.06	9	M	HF
ST 1493	1210	cut	claystone	0.37	0.05	9	P	HF
ST 1494	1270	cut	claystone	0.45	0.05	4	P	HF
ST 1495	1330	cut	claystone	0.48	0.05	18	P	HF
ST 1496	1390	cut	claystone	0.45	0.02	7	P	HF
ST 1497	1440	cut	claystone	0.49	0.01	2	P	HF
ST 1498	1500	cut	claystone	-	-	-	barren	HF
ST 1499	1555	swc	claystone	0.47	0.07	26	P	HF
ST 1500	1593	cut	limestone	-	-	-	barren	HF
ST 1501	1655.5	swc	claystone	0.54	0.06	21	P	HF
ST 1502	1698	cut	claystone	0.54	0.08	22	P	HF
ST 1503	1752	cut	lst/clst	-	-	-	barren	HF
ST 1504	1827.8	core	claystone	0.63	0.05	9	M	bulk
ST 1505	1858.6	core	claystone	-	-	-	barren	bulk
ST 1506	1932	cut	claystone	0.54	0.07	25	P	HF
ST 1507	1984	swc	claystone	0.65	0.07	23	P	HF
ST 1508	2036	swc	claystone	0.70	0.08	27	M	HF
ST 1509	2091	swc	claystone	0.69	0.03	12	M	HF
ST 1510	2130	swc	coal	0.74	0.05	26	G	bulk
ST 1511	2170	swc	coal	0.72	0.07	25	G	bulk
ST 1512	2216	swc	coal	0.75	0.06	22	M	HF
ST 1513	2286	swc	coal	0.72	0.06	30	M	bulk
ST 1514	2342	swc	coal	0.76	0.07	25	G	bulk
ST 1515	2384.5	core	coal	0.81	0.06	25	M	bulk
ST 1516	2450	swc	coal	0.87	0.06	25	M	bulk
ST 1658	2364.9	core	sst	0.76	0.05	23	M	bulk
ST 1659	2366.25	core	coal	0.71	0.03	20	M	bulk
ST 1660	2368.7	core	coal	0.75	0.07	25	G	bulk
ST 1661	2376.5	core	coal	0.79	0.06	25	G	bulk
ST 1662	2384.75	core	coal	0.85	0.04	24	G	bulk

G	Good quality	**P**	Poor quality	**A**	Mud additive	**HF**	HF-treated
M	Moderate quality	**X**	Not vitrinite	**Barren**	Barren of vitrinite	**Bulk**	Bulk rock

TABLE 4. VISUAL KEROGEN DESCRIPTION (%), WELL 7128/4-1.
(measured by IFE, report IFE/KR/F-94/113)

Depth m RKB	Sample no.	FA (%)	HA (%)	AL (%)	HE (%)	WO (%)	CO (%)	SCI
1555.00	S7875	5	0	0	90	0	5	n.d.
1566.00	S7879	0	50	10	35	0	5	n.d.
1679.00	S7900	5	10	10	45	5	25	n.d.
2009.00	S7905	5	5	0	65	5	20	n.d.
2366.58	S7987	0	0	0	5	5	90	n.d.
2366.90	S7969	0	0	0	0	5	95	n.d.
2376.28	S7990	0	3	0	2	0	95	n.d.
2450.00	S7918	0	3	0	5	2	90	n.d.

FA : Fluoramorphinite
HA : Hebamorphinite
AL : Algal organic matter
HE : Herbaceous organic matter
WO : Woody organic matter
CO : Coaly organic matter
SCI : Spore colour index

n.d. : not determined

TABLE 5. PYROLYSIS - GC DATA, WELL 7128/4-1.

Depth m RKB	Sample no.	C1 (%)	C2-C5 (%)	C6-C14 (%)	C15+ (%)
1555.00	S7875	4	14	27	54
1566.00	S7879	4	18	29	50
2366.58	S7987	13	3	12	72
2366.90	S7969	16	6	9	69
2376.28	S7990	14	7	12	67
2450.00	S7918	12	12	8	69

TABLE 6A. NORMALISED COMPONENT GROUP COMPOSITION (wt%) OF MINIEXTRACTED ORGANIC MATTER AND OILS, WELL 7128/4-1.

DEPTH (m RKB)	SAMPLE NR	TYPE	Rock (g)	EOM (mg)	EOM (ppm)	Sat (%)	Aro (%)	Pol (%)	Asph (%)	HC (%)	nonHC (%)
1548,00	S7874	swc	2,92	5,4	1849	69	12	7	11	82	18
1568,50	S7880	swc	6,84	3,6	526	40	8	21	31	48	52
1679,00	S7900	swc	3,65	7,7	2110	25	17	32	26	42	58
2009,00	S7905	swc	9,59	6	626	11	13	11	65	24	76
2366,58	S7987	core	9,90	149,3	15081	3	26	2	68	30	70
2366,90	S7969	core	9,94	35,1	3531	4	40	5	51	44	56
2376,28	S7990	core	10,38	53,2	5125	18	26	3	53	44	56
2450,00	S7918	swc	1,90	133,8	70421	4	28	5	62	33	67
1570,50	S7881	swc	4,85	4,9	1010	65	6	13	16	71	29
1571,50	S7882	swc	7,72	15,5	2008	82	9	5	5	91	9
1574,30	S7397	core	10,58	84,4	7977	27	3	69	0	31	69
1574,30	S7397d	core				23	0	59	17	23	76
1574,60	S7398	core	11,07	81,7	7380	29	3	67	0	33	67
1574,60	S7398d	core				30	0	67	3	30	70
2375,60	S7989	core	35,64	8,4	236	14	20	10	56	34	66
				API	%C15+						
1572,70	S7993	FMT			56	83	12	2	3	95	5
1576,00	S8392	FMT		41,7		89	9	0	2	98	2
1588,80	S7994	FMT			12	57	5	28	10	62	38
1610,00	S7995	DST 1A		46,0	50	89	9	1	1	98	2
1610,00	S7996	DST 1A+1B		46,9	50	89	9	2	0	98	2
1586,00	S7997	DST 2		45,8	62	90	8	2	0	98	2

d = duplicate analysis

TABLE 6B. COMPONENT GROUP COMPOSITION (CONCENTRATIONS) OF MINIEXTRACTED ORGANIC MATTER, WELL 7128/4-1.

DEPTH (m RKB)	SAMPLE NR	TYPE	TOC (%)	EOM	Sat	Aro	Pol	Asph	Sat / Aro	HC / non HC
				<---------- mg/g TOC ---------->						
1548.00	S7874	swc	0.4	462	320	57	34	51	5.58	1.01
1568.50	S7880	swc	0.2	263	104	22	56	80	4.74	0.26
1679.00	S7900	swc	1.9	111	28	19	35	29	1.45	0.63
2009.00	S7905	swc	1.2	52	6	7	6	34	0.82	0.20
2366.58	S7987	core	79.3	19	1	5	0	13	0.13	0.38
2366.90	S7969	core	53.1	7	0	3	0	3	0.11	0.75
2376.28	S7990	core	83.1	6	1	2	0	3	0.70	0.41
2450.00	S7918	swc	81.1	87	4	25	4	54	0.16	0.45

TABLE 7. GAS CHROMATOGRAPHIC DATA, WELL 7128/4-1.

DEPTH m RKB	TYPE	SAMPLE no.	A Pristane / n-C17	B Phytane / n-C18	A / B	Pr / Ph	nC17 / nC17+nC27	CPI 1	F 1	F 2	MPI 1	Rc
# 1548.00	swc	S7874	0.36	0.12	2.9	1.7	0.60	1.2				
# 1568.50	swc	S7880	0.86	1.1	0.82	0.53	0.46	1.9				
# 1679.00	swc	S7900	0.37	0.25	1.5	0.75	0.64	1.4				
# 2009.00	swc	S7905	0.44	0.64	0.69	0.26	0.46	4.4				
2366.58	core	S7987	0.58	0.30	1.9	1.7	0.61	1.1	0.47	0.24	0.74	0.84
2366.90	core	S7969	0.33	0.18	1.8	1.1	0.41	1.1	0.53	0.29	0.89	0.94
2376.28	core	S7990	0.78	0.32	2.4	2.5	0.64	1.1	0.46	0.23	0.68	0.81
2450.00	swc	S7918	0.78	0.47	1.6	1.4	0.34	1.0	0.48	0.24	0.77	0.86
# 1570.50	swc	S7881	0.54	0.39	1.4	0.66	0.28	1.4				
1571.50	swc	S7882	0.42	0.21	2.0	1.6	0.48	1.1	0.39	0.16	0.73	0.84
# 1574.30	core	S7397	0.54	0.23	2.3	2.2	0.57	1.5				
1574.30	core	S7397	0.65	0.29	2.2	1.8	0.52	1.1	0.48	0.21	0.84	0.90
# 1574.60	core	S7398	0.77	0.31	2.5	2.3	0.56	1.5				
1574.60	core	S7398	0.92	0.40	2.3	1.9	0.52	1.1	0.47	0.22	0.82	0.89
# 2375.60	swc	S7989	0.14	0.58	0.24	0.29	0.25	1.4				
# 1572.70	fmt	S7993	1.3	0.47	2.7	2.8	0.76	0.98				
1572.70	fmt	S7993ny	1.6	0.61	2.6	3.1	0.82	1.3	0.55	0.18	0.69	0.82
# 1576.00	fmt	S8392	0.4	0.21	2.1	2.0	0.61	1.1				
1576.00	fmt	S8392	0.46	0.24	1.9	1.6	0.59	1.1	0.44	0.21	0.67	0.80
# 1588.80	fmt	S7994	0.80	0.25	3.1	3.2	0.77	1.0				
1588.80	fmt	S7994ny	0.86	0.30	2.9	3.0	0.77	1.0	0.57	0.21	0.85	0.91
# 1610.00	dst1a	S7995	0.45	0.19	2.4	2.2	0.54	1.1				
1610.00	dst1a	S7995ny	0.44	0.23	2.0	1.8	0.61	1.1	0.46	0.21	0.72	0.83
# 1610.00	dst1a+1b	S7996	0.41	0.19	2.2	2.0	0.53	1.1				
1610.00	dst1a+1b	S7996ny	0.44	0.19	2.3	2.2	0.61	1.1	0.47	0.20	0.73	0.84
# 1586.00	dst2	S7997	0.46	0.20	2.3	2.1	0.53	1.1				
1586.00	dst2	S7997ny	0.44	0.20	2.2	2.2	0.60	1.1	0.47	0.20	0.74	0.85

Rc = 0.6* MPI1 + 0.4 (vitrinite reflectance equivalent)

Parameters are based on GC of saturated and aromatic fractions; in samples marked with "#" on GC of whole EOM/oil

TABLE 8. SATURATED BIOMARKER PARAMETERS[1], WELL 7128/4-1

Sample no.[2]	Depth (mRKB)	20S	ββ	22S	Ts/Tm	TtX	30D/H	30αβ
S7874*	1548.00	0.33	0.45	0.57	0.83	0.67	0.08	0.88
S7874d*	1548.00	0.29	0.41	0.60	0.75	0.64	0.07	0.88
S7880*	1568.50	0.38	0.42	0.58	0.97	0.40	0.05	0.87
S7900*	1679.00	0.39	0.34	0.58	0.66	0.67	0.07	0.86
S7905*	2009.00	0.35	0.33	0.58	0.41	0.95	0.11	0.80
S7987	2366.58	0.53	0.54	0.57	0.37	3.08	0.39	0.83
S7969	2366.90	0.50	0.52	0.58	0.67	4.27	0.38	0.86
S7990	2376.28	0.50	0.57	0.56	0.80	4.26	0.51	0.85
S7918	2450.00	0.50	0.51	0.58	0.34	2.82	0.30	0.82
S7881*	1570.50	0.50	0.54	0.59	0.95	0.64	0.07	0.92
S7882	1571.50	0.48	0.56	0.59	1.23	1.11	0.12	0.89
S7397	1574.30	0.54	0.52	0.62	1.49	2.67	0.23	0.91
S7398	1574.60	0.55	0.56	0.62	1.67	2.50	0.23	0.90
S7989*	2375.60			0.62	2.47	1.69	0.67	0.87
S7989d*	2375.60			0.62	2.35	1.94	0.69	0.87
S7993	FMT 1573	0.49	0.54	0.60	1.07	0.42	0.05	0.87
S8392	FMT 1576	0.40	0.49	0.62	1.36	2.57	0.20	0.89
S7994	FMT 1589	0.54	0.56	0.58	1.06	0.55	0.08	0.86
S7995	DST 1A	0.47	0.49	0.59	1.40	2.50	0.24	0.87
S7996	DST 1A+1B	0.49	0.53	0.57	1.30	1.80	0.19	0.87
S7997	DST 2	0.45	0.50	0.59	1.43	2.38	0.23	0.88

[1] The derivation of all parameters is described in Appendix 8.
[2] * = GCMS of whole EOM; d = duplicate analysis

TABLE 8. SATURATED BIOMARKER PARAMETERS[1], WELL 7128/4-1

Sample no.[2]	Depth (mRKB)	%C27	%C28	%C29	C30/ST	Dia	C28αβ	H/S
S7874*	1548.00	33	28	40	0.06	0.95	0.00	6.12
S7874d*	1548.00	31	28	41	0.08	0.77	0.00	9.51
S7880*	1568.50	35	27	38	0.07	1.05	0.05	7.61
S7900*	1679.00	34	26	41	0.08	1.03	0.00	6.31
S7905*	2009.00	41	25	35	0.10	1.29	0.05	6.82
S7987	2366.58	19	34	47	0.00	0.52	0.00	22.01
S7969	2366.90	27	30	43	0.00	0.54	0.00	26.52
S7990	2376.28	21	33	46	0.00	0.43	0.00	17.49
S7918	2450.00	18	33	49	0.00	0.42	0.00	14.94
S7881*	1570.50	37	30	33	0.06	1.62	0.12	3.52
S7882	1571.50	36	25	39	0.06	1.44	0.06	6.22
S7397	1574.30	35	27	38	0.06	1.80	0.00	6.38
S7398	1574.60	33	29	39	0.06	1.65	0.00	7.29
S7989*	2375.60						0.00	
S7989d*	2375.60						0.00	
S7993	FMT 1573	35	27	38	0.06	1.36	0.06	7.67
S8392	FMT 1576	39	25	36	0.04	1.87	0.00	6.65
S7994	FMT 1589	37	31	32	0.06	1.42	0.12	3.79
S7995	DST 1A	38	27	35	0.05	1.90	0.00	5.80
S7996	DST 1A+1B	37	30	32	0.05	1.60	0.11	4.33
S7997	DST 2	40	26	34	0.05	1.85	0.00	5.43

[1] The derivation of all parameters is described in Appendix 8.
[2] * = GCMS of whole EOM; d = duplicate analysis

TABLE 8. SATURATED BIOMARKER PARAMETERS[1], WELL 7128/4-1

Sample no.[2]	Depth (mRKB)	ppmH	ppmS	3R/H	4R/H	35/34H	29/30H	Dem/H	O/H	G/H
S7874*	1548.00	33	71	0.55	0.10	1.30	0.90	0.00	0.00	0.03
S7874d*	1548.00	609	64	0.40	0.00	1.48	0.87	0.00	0.00	0.05
S7880*	1568.50	1432	188	0.70	0.12	1.28	0.77	0.07	0.00	0.00
S7900*	1679.00	1136	180	0.63	0.10	1.00	0.72	0.00	0.00	0.02
S7905*	2009.00	607	89	0.69	0.18	2.00	0.76	0.08	0.00	0.00
S7987	2366.58	94	4	0.08	0.25	0.38	0.79	0.00	0.00	0.05
S7969	2366.90	97	4	0.08	0.18	0.43	0.68	0.00	0.00	
S7990	2376.28	98	6	0.09	0.36	0.51	0.76	0.00	0.00	
S7918	2450.00	184	12	0.06	0.15	0.44	0.64	0.00	0.00	0.07
S7881*	1570.50	1273	362	0.24	0.11	1.31	0.98	0.05	0.00	0.03
S7882	1571.50	430	69	0.96	0.00	0.81	0.93	0.06	0.00	0.01
S7397	1574.30	62	10	0.60	0.19	0.78	0.67	0.00	0.00	0.00
S7398	1574.60	29	4	0.63	0.22	0.84	0.67	0.00	0.00	0.02
S7989*	2375.60	63	0	1.06	1.09	0.31	0.67	0.00	0.00	0.09
S7989d*	2375.60	58	0	1.09	1.18	0.22	0.71	0.00	0.00	0.09
S7993	FMT 1573			0.20	0.11	3.57	0.76	0.14	0.00	0.03
S8392	FMT 1576	67	10	0.76	0.27	0.70	0.68	0.00	0.00	0.02
S7994	FMT 1589			0.32	0.20	0.95	0.80	0.26	0.00	0.02
S7995	DST 1A			0.68	0.26	0.58	0.72	0.00	0.00	
S7996	DST 1A+1B			0.76	0.24	0.71	0.76	0.26	0.00	
S7997	DST 2			0.75	0.19	0.63	0.74	0.00	0.00	

[1] The derivation of all parameters is described in Appendix 8.
[2] * = GCMS of whole EOM; d = duplicate analysis

TABLE 9. AROMATIC STEROID BIOMARKER PARAMETERS[1], WELL 7128/4-1.

Sample no.	Depth (mRKB)	Arom1	Arom2	Crack1	Crack2
S7987	2 366.58	n.d.	n.d.	n.d.	n.d.
S7969	2 366.90	n.d.	n.d.	n.d.	n.d.
S7990	2 376.28	n.d.	n.d.	n.d.	n.d.
S7918	2 450.00	n.d.	n.d.	n.d.	n.d.
S7882	1 571.50	0.71	0.50	0.76	0.50
S7397	1574.30	n.d.	n.d.	n.d.	n.d.
S7398	1574.60	n.d.	n.d.	n.d.	n.d.
S7993	FMT 1573m	0.33	0.25	0.24	0.25
S8392	FMT 1576m	0.72	0.53	0.71	0.45
S7994	FMT 1589m	0.59	0.38	0.55	0.30
S7995	DST 1A	0.80	0.61	0.80	0.52
S7996	DST 1A+1B	0.76	0.62	0.78	0.53
S7997	DST 2	0.77	0.65	0.77	0.52

n.d. not determined

[1] The derivation of all parameters is described in Appendix 9

TABLE 10. CARBON ISOTOPE RATIOS OF WHOLE OILS, COMPOUND CLASSES AND KEROGENS, WELL 7128/4-1 (measured by IFE; report IFE/KR/f-94/106).

Depth m RKB	Sample no.	Whole oil $\delta^{13}C$ ‰	Sat $\delta^{13}C$ ‰	Aro $\delta^{13}C$ ‰	Pol $\delta^{13}C$ ‰	Asph $\delta^{13}C$ ‰	Kerogen $\delta^{13}C$ ‰
1555.00	S7875						-31.4
1560.00	S7879						-31.4
1548.00	S7874	-27.4*				-27.9	
1568.50	S7880	-28.4*				-29.1	
1679.00	S7900	-27.5*				-26.9	
2009.00	S7905	-27.3*				-27.3	
2366.60	S7987		-25.6	-23.4	-23.3	-23.2	-22.8
2366.90	S7969		-26.4	-23.6	-23.3	-24.4	-24.3
2376.30	S7990		-26.5	-22.8	-23.3	-22.6	-23.5
2450.00	S7918		-27.7	-23.8	-23.7	-23.3	
1570.50	S7881	-27.9*				-27.1	
1571.50	S7882		-27.3	-27.4	n.d.	-27.3	
2375.60	S7989	-25.2*				-26.4	
FMT 1572,7	S7993	-27.8	-27.8	-28.4	-27.3	-28.3	
FMT 1588,8	S7994	-28.3	-27.3	-27.5	-29.7	-29	
DST 1A	S7995	-26.7	-26.7	-26.6	-27.4	-27.5	
DST 1A+1B	S7996	-26.8	-26.9	-26.3	-27.4	-26.9	
DST 2	S7997	-26.9	-27	-26.3	-27.4	-26.9	

* EOM without asphaltenes
n.d.: not determined

TABLE 11. THOMPSON INDICES FOR FLUID SAMPLES, WELL 7128/4-1

Sample name	Sample no.	Thompson Indices[1] A	B	X	W	C	I	F	H	U	R	S
FMT, 1572.7 m	S7993	0.39	1.27	1.04	2.76	0.59	1.96	0.56	23.80	2.23	3.03	19.10
FMT, 1576 m	S8392	0.42	0.03	0.93	1.60	0.41	1.93	0.42	17.30	2.66	1.91	19.40
FMT, 1588.8 m	S7994	0.38	0.96	0.22	3.58	0.65	2.03	0.59	24.90	2.08	2.75	n.d.
DST 1A	S7995	0.34	0.36	0.70	3.21	0.77	2.26	0.65	21.30	1.87	2.01	13.60
DST 1A+1B	S7996	0.36	0.40	0.71	3.07	0.72	2.22	0.64	22.00	1.98	2.16	15.70
DST 2	S7997	0.37	0.38	0.72	3.07	0.71	2.22	0.64	21.80	2.02	2.13	18.50

[1] From Thompson (1983)

Aromaticity

A = benzene/nC_6 B = toluene/nC_7 X = m+p-xylenes/nC_8 W = 10*benzene/cC_6

Paraffinicity

C = (nC_6+nC_7)/(cC_6+mcC_6) I = ($2mC_6$+$3mC_6$)/(1cis3dmcC_5+1t3dmcC_5+1t2dmcC_5)
F = nC_7/mcC_6
H = (100*nC_7)/(cC_6+$2mC_6$+2,3dmcC_5+$3mC_6$+1cis3dmcC_5+1t3dmcC_5+1t2dmcC_5+nC_7+mcC_6)

Naphthene branching

U = cC_6/mcC_5

Paraffin branching

R = nC_7/$2mC_6$ S = nC_6/2,2dmC_4

Codes: n = normal; c = cyclo; C_6 = hexane (etc); m = methyl; dm = dimethyl; t = trans

TABLE 12a. VOLUME COMPOSITION OF GAS SAMPLES, WELL 7128/4-1
(measured by IFE, see Appendix 10)

Sample	IFE no	C_1 %	C_2 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	CO_2 %	ΣC_1-C_5	Wet-ness	iC_4/ nC_4/
7128/4-1, 1572.7m FMT	13846	92.9	3.9	1.5	0.30	0.5	0.17	0.14	0.6	99.4	0.07	0.58
7128/4-1, 1576m FMT	13847	89.5	6.7	2.3	0.34	0.5	0.12	0.10	0.4	99.6	0.10	0.70
7128/4-1, 9.02.94, DST 1-1A	13848	92.3	4.0	1.8	0.44	0.7	0.22	0.20	0.3	99.7	0.07	0.59
7128/4-1, 10.02.94, DST 1A & 1B	13849	91.8	4.4	1.8	0.40	0.8	0.23	0.22	0.4	99.6	0.08	0.53
7128/4-1, 17.02.94, DST 2	13850	78.9	9.3	4.9	1.3	2.2	0.94	0.91	1.5	98.5	0.20	0.57

TABLE 12b. ISOTOPIC COMPOSITION OF GAS SAMPLES, WELL 7128/4-1
(measured by IFE, see Appendix 10)

Sample	IFE no	C_1 $\delta^{13}C$ ‰ PDB	C_1 δD ‰ SMOW	C_2 $\delta^{13}C$ ‰ PDB	C_3 $\delta^{13}C$ ‰ PDB	iC_4 $\delta^{13}C$ ‰ PDB	nC_4 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{18}O$ ‰ PDB
7128/4-1, 1572.7m FMT	13846	-37.7	-199	-29.5	-27.5	-25.0	-26.6	-7.7	-4.2
7128/4-1, 1576m FMT	13847	-31.4	-172	-26.9	-26.5	-25.0	-25.7	-6.8	-6.0
7128/4-1, 9.02.94, DST 1-1A	13848	-36.7	-188	-27.2	-26.3	-24.2	-25.9	1.0	-5.6
7128/4-1, 10.02.94, DST 1A & 1B	13849	-37.8	-201	-29.9	-27.6	-25.3	-27.0	2.7	-6.9
7128/4-1, 17.02.94,	13850	26.1	nd	-27.7	-23.2	-26.2	nd	-10.4	-5.9
DST 2		48.4	nd	-6.7	-17.1	-20.1	-21.8	-5.8	-3.6

nd - not determined

APPENDIX 1.

VITRINITE REFLECTANCE WELL 7128/4-1, OFFSHORE NORWAY
REPORT IFE/KR/F-94/070
+
REPORT IFE/KR/F-94/114

Institutt for energiteknikk

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PREPARED BY	Kristine Aasgaard	1994-05-09	Kristine Aasgaard
REVIEWED BY	Torbjørn Throndsen	1994-05-09	Torbjørn Throndsen
APPROVED BY	Henning Qvale	1994-05-09	Henning Qvale

1 Introduction

This report gives the result of routine vitrinite reflectance analyses on 31 samples covering the interval from 820.5 to 2450 mRKB in well 7128/4-1 offshore Norway.

2 Material

2.1 Samples

The material was provided from the client as 14 unwashed cuttings, 14 sidewall core chips and 3 core chips. The sample positions are indicated in figure 1.

2.2 Geological information and casing points

Information on the stratigraphy was supplied from the client and is shown in figure 1. No casing point depths were made available.

3 Analytical techniques

3.1 Preparation

The cuttings samples and 9 of the side wall core samples were treated with hydrochloric and hydrofluoric acid prior to further preparation. The aim was to avoid soft and expanding mineral phases in order to ensure good polishing quality. The core samples and 5 side wall core samples were treated as bulk material.

The sample material resulting from the acid treatment and the bulk samples were embedded in an epoxy resin to make briquettes, ground flat and polished using 0.25 micron diamond paste and magnesium oxide as the two final steps.

3.2 Analysis

The analytical equipment being used was a Zeiss MPM 03 photometer microscope equipped with an Epiplan-Neofluar 40/0.90 oil objective. The sensitive measuring spot was kept constant for all measurements at about 2.5 micron in diameter. The measurements were made through a green band pass filter (546 nm) and in oil immersion (refractive index 1.515 at 18°C). The readings were made without a polarizer and using a stationary stage. This procedure is called measurement of random reflectance (%Rm). The photometer is calibrated daily against a standard of known reflectance (%Rm= 0.588) and routinely (daily) checked against two other standards of significant different reflectances (%Rm=0.879 and 1.696). A deviation from these values of less than ±0.01 and ±0.02 respectively is considered as acceptable. The calibration is routinely checked during the course of measurements at least every hour, and a deviation of less than ±0.005 is considered as accptable.

For each sample at least 20 points were measured if possible, and quality ratings are given to various important aspects which may affect the measurements. The aspects are abundance of vitrinite, uncertainties in the identification of indigenous vitrinite, type of vitrinite, particle size, particle surface quality and abundance of pyrite.

3.3 Presentation of results

The raw data from the measurements are presented in appendix for each sample both as tabulated data and histograms. A true vitrinite population is selected among the readings based on observations made during the measurements, and arithmetic mean values are calculated for this population and other populations. A quality rating is given to the true population. The results are listed in table 1.

The results are presented as vitrinite reflectance versus depht plots on linear and semilogarithmic scales (figure 1). A vitrinite reflectance versus depth trend is interpreted manually on the linear plot and transferred to the semilogarithmic plot. The interpreted trend is also listed in table 2.

4 Results

There has been a problem with oil staining in the vitrinite in most of the samples. Oil staining leads to lowered reflectance values and is indicated in the quality rating for each sample by lowered particle surface quality. Although the sample quality in the upper and middle part of the well (820.5-1984 mRKB) is generally poor, is has been possible to establish a fairly reliable vitrinite versus depth trend.

Table 1 Vitrinite reflectance data

Well
7128/4-1

IFE no.	Depth, mRKB	Sample type	Lithology	%Rm	Std. dev.	N	Quality	Preparation
ST 1486	820.5	swc	sandstone	0.34	0.08	10	P	HF
ST 1487	890	cut	claystone	0.43	0.07	19	P	HF
ST 1488	925	swc	sandstone	0.39	0.03	7	P	HF
ST 1489	1000	cut	clst/sst	-	-	-	barren	HF
ST 1490	1050	cut	claystone	0.37	0.05	8	P	HF
ST 1491	1092.5	swc	claystone	-	-	-	barren	HF
ST 1492	1150	cut	claystone	0.49	0.06	9	M	HF
ST 1493	1210	cut	claystone	0.37	0.05	9	P	HF
ST 1494	1270	cut	claystone	0.45	0.05	4	P	HF
ST 1495	1330	cut	claystone	0.48	0.05	18	P	HF
ST 1496	1390	cut	claystone	0.45	0.02	7	P	HF
ST 1497	1440	cut	claystone	0.49	0.01	2	P	HF
ST 1498	1500	cut	claystone	-	-	-	barren	HF
ST 1499	1555	swc	claystone	0.47	0.07	26	P	HF
ST 1500	1593	cut	limestone	-	-	-	barren	HF
ST 1501	1655.5	swc	claystone	0.54	0.06	21	P	HF
ST 1502	1698	cut	claystone	0.54	0.08	22	P	HF
ST 1503	1752	cut	lst/clst	-	-	-	barren	HF
ST 1504	1827.8	core	claystone	0.63	0.05	9	M	bulk
ST 1505	1858.6	core	claystone	-	-	-	barren	bulk
ST 1506	1932	cut	claystone	0.54	0.07	25	P	HF
ST 1507	1984	swc	claystone	0.65	0.07	23	P	HF
ST 1508	2036	swc	claystone	0.70	0.08	27	M	HF
ST 1509	2091	swc	claystone	0.69	0.03	12	M	HF
ST 1510	2130	swc	coal	0.74	0.05	26	G	bulk
ST 1511	2170	swc	coal	0.72	0.07	25	G	bulk
ST 1512	2216	swc	coal	0.75	0.06	22	M	HF
ST 1513	2286	swc	coal	0.72	0.06	30	M	bulk
ST 1514	2342	swc	coal	0.76	0.07	25	G	bulk
ST 1515	2384.5	core	coal	0.81	0.06	25	M	bulk
ST 1516	2450	swc	coal	0.87	0.06	25	M	bulk

G	Good quality	**P**	Poor quality	**A**	Mud additive	**HF**	HF-treated
M	Moderate quality	**X**	Not vitrinite	**Barren**	Barren of vitrinite	**Bulk**	Bulk rock

ife

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REVIEWED BY	Torbjørn Throndsen	1994-08-08	Torbj. Throndsen
APPROVED BY	Arne Råheim	1994-08-08	Arne Råheim

1 Introduction

This report gives the result of routine vitrinite reflectance analyses on 5 samples covering the interval from 2364.90 to 2384.75 mRKB in well 7128/4-1 offshore Norway.

2 Material

2.1 Samples

The material was provided from the client as 5 core chips.

2.2 Geological information and casing points

Information on the formation tops and casing points was not made available from the client.

3 Analytical techniques

3.1 Preparation

The core chips were treated as bulk material.

The sample material was embedded in an epoxy resin to make briquettes, ground flat and polished using 0.25 micron diamond paste and magnesium oxide as the two final steps.

3.2 Analysis

The analytical equipment being used was a Zeiss MPM 03 photometer microscope equipped with an Epiplan-Neofluar 40/0.90 oil objective. The sensitive measuring spot was kept constant for all measurements at about 2.5 micron in diameter. The measurements were made through a green band pass filter (546 nm) and in oil immersion (refractive index 1.515 at 18°C). The readings were made without a polarizer and using a stationary stage. This procedure is called measurement of random reflectance (%Rm). The photometer is calibrated daily against a standard of known reflectance (%Rm= 0.588) and routinely (daily) checked against two other standards of significant different reflectances (%Rm=0.879 and 1.696). A deviation from these values of less than ±0.01 and ±0.02 respectively is considered as acceptable. The calibration is routinely checked during the course of measurements at least every hour, and a deviation of less than ±0.005 is considered as acceptable.

For each sample at least 20 points were measured if possible, and quality ratings are given to various important aspects which may affect the measurements. The aspects are abundance of vitrinite, uncertainties in the identification of indigenous vitrinite, type of vitrinite, particle size, particle surface quality and abundance of pyrite.

Table 1 Vitrinite reflectance data

Well
7128/4-1

IFE no.	Depth, mRKB	Sample type	Lithology	%Rm	Std. dev.	N	Quality	Preparation
ST 1658	2364.9	core	sst	0.76	0.05	23	M	bulk
ST 1659	2366.25	core	coal	0.71	0.03	20	M	bulk
ST 1660	2368.7	core	coal	0.75	0.07	25	G	bulk
ST 1661	2376.5	core	coal	0.79	0.06	25	G	bulk
ST 1662	2384.75	core	coal	0.85	0.04	24	G	bulk

G	Good quality	**P**	Poor quality	**A**	Mud additive	**HF**	HF-treated
M	Moderate quality	**X**	Not vitrinite	**Barren**	Barren of vitrinite	**Bulk**	Bulk rock

Derivation of biomarker ratios reported in Table 8

Ratio	Derivation	m/z
Triterpanes		
22S	32αβS/(32αβS+32αβR)	191
Ts/Tm	27Ts/27Tm	191
TtX	30d/29βα	191
30D/H	30d/30αβ	191
29/30H	29αβ/30αβ	191
30αβ	30αβ/(30αβ+30βα)	191
28αβ/H	28αβ/30αβ	191
3R/H	(23/3)/30αβ	191
4R/H	(24/4)/30αβ	191
35/34H	(35αβR+35αβS)/(34αβR+34αβS)	191
Dem/H	25nor30αβ/30αβ	191
O/H	30O/30αβ	191
G/H	30G/30αβ	191
ppmH*	Σ27Ts+27Tm+29αβ+29βα+30αβ+30βα+31αβS+31αβR+32αβS+32αβR +33αβS+33αβR +34αβS+34αβR+35αβS+35αβR	191
Steranes		
20S	29ααS/(29ααR+29ααS)	217
ββ	(29ββR+29ββS)/(29ββR+29ββS+29ααR+29ααS)	217
%C27	100*(27ββR+27ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)	218
%C28	100*(28ββR+28ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)	218
%C29	100*(29ββR+29ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)	218
C30/st	(30ββR+30ββS)/(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)	218
Dia/reg	(27dβR+27dβS)/(27ααR+27ααS)	217
ppmS*	ppm 27ββR+27ββS+28ββR+28ββS+29ββR+29ββS	218
H/S	Intensities(27Ts+27Tm+29αβ+29βα+30αβ+30βα+31αβS+31αβR +32αβS+32αβR+33αβS+33αβR+34αβS+34αβR+35αβS+35αβR) / Intensities(27ββR+27ββS+28ββR+28ββS+29ββR+29ββS)	

* ppm calculated from comparison with m/z 219 intensity for D2-cholestane

Biomarker codes used in derivation of ratios

Compound name	Old code	NEW CODE
Triterpanes		
$C_{23}H_{42}$ tricyclic terpane	P	23/3
$C_{24}H_{44}$ tricyclic terpane	Q	24/3
$C_{25}H_{46}$ tricyclic terpane[1]	R	25/3
$C_{24}H_{42}$ tetracyclic terpane	S	24/4
$C_{26}H_{48}$ tricyclic terpane[2]	T	26/3
18α(H)-22,29,30-trisnorneohopane	27A	27Ts
17α(H)-22,29,30-trisnorhopane	27B	27Tm
17α(H), 21β(H)-25,28,30-trisnorhopane		25nor28αβ[3]
17α(H), 21β(H)-28,30-bisnorhopane	28A	28αβ
17α(H), 21β(H)-25-norhopane		25nor30αβ[3]
17α(H), 21β(H)-30-norhopane	C29A	29αβ
18α(H)-30-norneohopane		29Ts
15α-methyl-17α(H)-27-norhopane (TtX)	X	30D
17β(H), 21α(H)-30-norhopane (normoretane)	C29B	29βα
18α(H)-oleanane		30Oα
18β(H)-oleanane		30Oβ
17α(H), 21β(H)-hopane	C30A	30αβ
17β(H), 21α(H)-hopane (moretane)	C30B	30βα
Gammacerane		30G
17α(H), 21β(H), 22(S)-homohopane	C31S	31αβS
17α(H), 21β(H), 22(R)-homohopane	C31R	31αβR
17α(H), 21β(H), 22(S)-bishomohopane	C32S	32αβS
17α(H), 21β(H), 22(R)-bishomohopane	C32R	32αβR
17α(H), 21β(H), 22(S)-trishomohopane	C33S	33αβS
17α(H), 21β(H), 22(R)-trishomohopane	C33R	33αβR
17α(H), 21β(H), 22(S)-tetrakishomohopane	C34S	34αβS
17α(H), 21β(H), 22(R)-tetrakishomohopane	C34R	34αβR
17α(H), 21β(H), 22(S)-pentakishomohopane	C35S	35αβS
17α(H), 21β(H), 22(R)-pentakishomohopane	C35R	35αβR

[1] may be broad peak or doublet
[2] may be doublet
[3] listed here as "nor28" and "nor30" for convenience

Steranes

13β(H), 17α(H), 20(S)-cholestane (diasterane)	27a	27dβS
13β(H), 17α(H), 20(R)-cholestane (diasterane)	27b	27dβR
13α(H), 17β(H), 20(R)-cholestane (diasterane)	27c	27dαR
13α(H), 17β(H), 20(S)-cholestane (diasterane)	27d	27dαS
5α(H), 14α(H), 17α(H), 20(S)-cholestane	27e	27ααS
5α(H), 14β(H), 17β(H), 20(R)-cholestane	27f	27ββR
5α(H), 14β(H), 17β(H), 20(S)-cholestane	27g	27ββS
5α(H), 14α(H), 17α(H), 20(R)-cholestane	27h	27ααR
24-methyl-13β(H), 17α(H), 20(S)-cholestane (diasterane)	28a	28dβS
24-methyl-13β(H), 17α(H), 20(R)-cholestane (diasterane)	28b	28dβR
24-methyl-13α(H), 17β(H), 20(R)-cholestane (diasterane)	28c	28dαR
24-methyl-13α(H), 17β(H), 20(S)-cholestane (diasterane)	28d	28dαS
24-methyl-5α(H), 14α(H), 17α(H), 20(S)-cholestane	28e	28ααS
24-methyl-5α(H), 14β(H), 17β(H), 20(R)-cholestane	28f	28ββR
24-methyl-5α(H), 14β(H), 17β(H), 20(S)-cholestane	28g	28ββS
24-methyl-5α(H), 14α(H), 17α(H), 20(R)-cholestane	28h	28ααR
24-ethyl-13β(H), 17α(H), 20(S)-cholestane (diasterane)	29a	29dβS
24-ethyl-13β(H), 17α(H), 20(R)-cholestane (diasterane)	29b	29dβR
24-ethyl-13α(H), 17β(H), 20(R)-cholestane (diasterane)	29c	29dαR
24-ethyl-13α(H), 17β(H), 20(S)-cholestane (diasterane)	29d	29dαS
24-ethyl-5α(H), 14α(H), 17α(H), 20(S)-cholestane	29e	29ααS
24-ethyl-5α(H), 14β(H), 17β(H), 20(R)-cholestane	29f	29ββR
24-ethyl-5α(H), 14β(H), 17β(H), 20(S)-cholestane	29g	29ββS
24-ethyl-5α(H), 14α(H), 17α(H), 20(R)-cholestane	29h	29ααR
24-propyl-5α(H), 14α(H), 17α(H), 20(S)-cholestane	30e	30ααS
24-propyl-5α(H), 14β(H), 17β(H), 20(R)-cholestane	30f	30ββR
24-propyl-5α(H), 14β(H), 17β(H), 20(S)-cholestane	30g	30ββS
24-propyl-5α(H), 14α(H), 17α(H), 20(R)-cholestane	30h	30ααR
4-methyl-14α(H), 17α(H)-cholestanes		M28ααR
4,24-dimethyl-14α(H), 17α(H)-cholestanes		M29ααR
4-methyl-24-ethyl-14α(H), 17α(H)-cholestanes		M30ααR
4,23,24-trimethyl-14α(H), 17α(H)-cholestanes (dinosteranes)		M30D

Sample nr.	Depth (m)	<---m/z191 Intens.	23/3	24/4	27Ts	27Tm	28ab	nor30	29ab	30d	29ba	30O	30ab	30ba	31abS	31abR	32abS	32abR	33abS	33abR	34abS	34abR	35abS	35abR
* S7874	1.548,00	1412864	460	85	175	210			760	70	105		840	110	445	355	280	210	210	150	125	90	200	80
* S7874d	1.548,00	4260000	380		135	180			835	70	110		960	130	530	410	325	220	240	160	140	90	260	80
* S7880	1.568,50	2408448	525	90	150	155	35	50	570	40	100		745	115	390	290	210	155	160	110	90	70	155	50
* S7900	1.679,00	5109760	630	95	145	220			720	70	105		995	160	485	370	360	260	280	190	230	150	230	150
* S7905	2.009,00	1777664	570	150	120	295	40	70	630	95	100		830	205	425	305	210	150	125	90	70	50	210	30
S7987	2.366,58	30670848	85	260	125	340	0	0	805	400	130		1025	210	720	585	490	365	245	165	160	100	60	40
S7969	2.366,90	2091886	70	150	160	240	0	0	565	320	75		835	135	520	360	380	270	180	140	110	75	50	30
S7990	2.376,28	9187328	90	350	295	370	0	0	730	490	115		965	175	605	470	400	320	170	130	120	65	60	35
S7918	2.450,00	45088768	65	155	105	310	0	0	660	310	110		1030	220	705	580	510	365	260	175	175	110	70	55
* S7881	1.570,50	8161280	240	110	275	290	120	50	970	70	110		990	90	465	350	260	180	180	125	100	60	155	55
S7882	1.571,50	8801057	835		240	195	50	55	810	105	95		870	110	535	385	320	225	210	150	115	70	100	50
S7397	1.574,30	4805632	53	17	26	17,5			59	20	7,5		88	9	41	25,5	28,5	17,5	15	10	11,5	6,5	8	6
S7398	1.574,60	3822592	55	19	30	18			59	20	8		88	10	47	30	32	19,5	19,5	13	14	8	10,5	8
* S7989	2.375,60	2308096	350	360	210	85			220	220	130		330	50	190	150	200	125	100	75	80	50		40
* S7989d	2.375,60	636000	490	530	270	115			320	310	160		450	65	260	200	260	160	150	110	120	60		40
S7993	FMT 1573	14907620	195	110	240	225	60	140	750	50	120		985	145	365	275	220	145	150	100	70	45	60	350
S8392	FMT 1576	3344384	67	24	34	25			60	18	7		88	11	40	26	26	16	12	8,5	9	4,5	5,5	4
S7994	FMT 1589	2591949	250	160	250	235	95	205	630	60	110		790	125	300	230	180	130	120	90	70	40	65	40
S7995	DST 1A	2434194	500	190	295	210			530	175	70		740	110	340	225	200	140	110	90	70	50	40	30
S7996	DST 1A+1B	3105997	550	175	300	230	80	185	550	135	75		725	105	350	240	200	150	135	105	70	50	50	35
S7997	DST 2	2390426	615	155	330	230			610	190	80		820	110	390	255	230	160	130	100	70	50	45	30
Bulgaria11		60407808	75	95	205	150	200	40	450	105	105	285	1035	165	440	335	340	250	240	180	150	100	150	105
Bulgaria19		64962560	70	85	205	150	200	35	460	100	100	295	1045	170	440	335	335	245	235	170	130	95	130	95
Bulgaria01		27754496	60	70	170	130	175	30	440	85	75	250	1040	140	410	300	320	225	210	160	130	90	125	95
Bulgaria06		20508672	60	90	210	150	205	20	490	110	95	290	1040	160	415	330	330	250	230	175	145	100	150	110

* measured on GCMS of whole EOM

Sample nr.	Depth (m)	m/z217 Intens	27DbS	27DbR	27aaS	27aaR	29aaS	29bbR	29bbS	29aaR	m/z218 Intens	27bbR	27bbS	28bbR	28bbS	29bbR	29bbS	30bbR	30bbS	m/z219 Intens	27D2	ppm
*S7874	1548	484224	350	280	250	410	240	310	290	480	494016	360	300	270	290	400	410	65	65	6250000	1050	463
*S7874d	1548	1220000	270	240	210	450	240	295	290	595	1010000	360	300	300	300	420	450	90	75	13600000	1145	463
*S7880	1568,5	435840	520	350	330	495	360	335	350	590	386240	560	445	390	385	550	550	100	90	3983360	1030	694
*S7900	1679	1619968	605	425	460	540	520	350	360	830	1075712	725	550	490	495	790	750	145	140	7166976	1030	325
*S7905	2009	612864	530	370	300	400	295	205	215	555	459456	500	385	260	280	390	365	140	80	4558848	1030	417
S7987	2366,58	3147776	165	205	290	420	525	615	545	465	3524608	245	175	335	420	530	495	n.d.	n.d.	84213760	1080	50
S7969	2366,9	261184	115	105	130	275	210	225	225	210	351808	130	120	125	150	200	200	n.d.	n.d.	5989376	1055	71
S7990	2376,28	1652736	115	140	250	340	270	380	340	270	1184000	310	160	350	375	525	510	n.d.	n.d.	20815872	1060	47
S7918	2450	6777856	135	155	280	410	475	525	465	475	4671488	420	210	575	595	910	805	n.d.	n.d.	60997632	1070	49
*S7881	1570,5	3236864	800	625	430	450	320	390	360	320	2640896	840	680	580	650	660	680	135	125	14639104	1040	510
S7882	1571,5	2533376	460	570	365	350	320	450	410	350	1603584	810	600	470	530	755	790	105	120	14200832	1040	161
S7397	1574,3	1481472	44	57	27	29	30	30	30	26	914432	64	43	44	41	57	61	9	9	13250560	104	47
S7398	1574,6	1387008	33	43	20	26	24	34	23	20	1163008	36	25	28	26	37	35	6	6	23728128	112	49
*S7989	2375,6	no reliable identification / quantitation possible									no reliable identification / quantitation possible									21100000	1050	298
*S7989d	2375,6	no reliable identification / quantitation possible									no reliable identification / quantitation possible									7850000	1140	298
S7993	FMT 1573	2308096	810	560	470	540	480	585	535	490	1840384	840	710	590	640	855	850	160	130			
S8392	FMT 1576	1158912	59	61	30,2	34	17	21	20	25	688896	63	43	34	36	49	50	6,2	5,6	8356864	113	50
S7994	FMT 1589	754176	670	480	380	430	350	420	400	300	670976	695	595	530	555	540	560	105	90			
S7995	DST 1A	922624	600	485	260	310	205	215	200	230	492416	595	465	375	365	480	490	75	70			
S7996	DST 1A+1B	1164544	530	505	295	350	245	300	275	260	770048	650	520	450	500	510	510	85	80			
S7997	DST 2	1030912	545	535	270	315	200	230	210	240	586752	635	455	350	350	470	470	75	70			
Bulgaria11		12328960	510	380	720	905	910	650	605	885	11341824	765	685	965	950	880	910	160	140			
Bulgaria19		13524992	500	375	685	920	860	650	580	875	12005376	815	670	975	980	910	790	155	140			
Bulgaria01		3699712	485	340	665	835	900	630	585	880	3933184	750	640	950	900	870	800	150	135			
Bulgaria06		3731456	500	350	670	860	900	665	580	865	3219456	760	655	940	880	900	790	155	135			

* measured on GCMS of whole EOM

Derivation of aromatic steroid ratios reported in Table 9

Arom 1 = g1/((g1+H1b+I1) - (H1b*f1/g1))

Arom 2 = (a1+b1+c1+d1+e1+f1+g1)/(a1+b1+c1+d1+e1+f1+g1+A1+B1+C1+D1+E1+F1+G1+H1+I1)

Crack 1 = a1/(a1+g1)

Crack 2 = (a1+b1)/(a1+b1+c1+d1+e1+f1+g1)

N.B. H1b refers to second eluting (split) peak of doublet corresponding to H1 in standard figure

Codes for aromatic steroids

ABC-RING TRIAROMATIC STEROID HYDROCARBONS (m/z 231)

	Substituents		
Peak	R_1	R_2	Abbreviation of Compound
a1	CH_3	H	$C_{20}TA$
b1	CH_3	CH_3	$C_{21}TA$
c1	$S(CH_3)$	C_6H_{13}	$SC_{26}TA$
d1	$R(CH_3)$	C_6H_{13}	$RC_{26}TA$
	$S(CH_3)$	C_7H_{15}	$SC_{27}TA$
e1	$S(CH_3)$	C_8H_{17}	$SC_{28}TA$
f1	$R(CH_3)$	C_7H_{15}	$RC_{27}TA$
g1	$R(CH_3)$	C_8H_{17}	$RC_{28}TA$

C-RING MONOAROMATIC STEROID HYDROCARBONS (m/z 253)

Peak	Substituents R_1	R_2	R_3	R_4	Abbreviation of Compound
A1					$C_{21}M$
B1					$C_{22}MA$
C1	β(H)	CH_3	$S(CH_3)$	H	$\beta SC_{27}MA$
	$\beta(CH_3)$	H	$S(CH_3)$	H	$\beta SC_{27}DMA$
D1	$\beta(CH_3)$	H	$R(CH_3)$	H	$\beta RC_{27}DMA$
	β(H)	CH_3	$R(CH_3)$	H	$\beta RC_{27}MA$
	α(H)	CH_3	$S(CH_3)$	H	$\alpha SC_{27}MA$
E1	β(H)	CH_3	$S(CH_3)$	CH_3	$\beta SC_{28}MA$
	$\alpha(CH_3)$	H	$R(CH_3)$	H	$\alpha RC_{27}DMA$
	$\beta(CH_3)$	H	$S(CH_3)$	CH_3	$\beta SC_{28}DMA$
F1	$\alpha(CH_3)$	H	$S(CH_3)$	CH_3	$\alpha SC_{27}DMA$
	α(H)	CH_3	$R(CH_3)$	H	$\alpha RC_{27}MA$
	α(H)	CH_3	$S(CH_3)$	CH_3	$\alpha SC_{28}MA$
G1	β(H)	CH_3	$R(CH_3)$	CH_3	$\beta RC_{28}MA$
	$\beta(CH_3)$	H	$R(CH_3)$	CH_3	$\beta RC_{28}DMA$
	β(H)	CH_3	$S(CH_3)$	C_2H_5	$\beta SC_{29}MA$
	βCH_3	H	$S(CH_3)$	C_2H_5	$\beta SC_{29}DMA$
	α(H)	CH_3	$S(CH_3)$	C_2H_5	$\alpha SC_{29}MA$
	α(H)	CH_3	$R(CH_3)$	CH_3	$\alpha RC_{28}MA$
H1	β(H)	CH_3	$R(CH_3)$	C_2H_5	$\beta RC_{29}MA$
	βCH_3	H	$R(CH_3)$	C_2H_5	$\beta RC_{29}DMA$
I1	α(H)	CH_3	$R(CH_3)$	C_2H_5	$\alpha RC_{29}MA$

N.B. Not all possible DMA isomers are marked (rarely present in geological samples)

Sample Type	Sample Nr.	Depth (mRKB)	m/z 231 triaromsteroids a1	b1	c1	d1	e1	f1	g1	m/z 253monoarsteroids A1	B1	C1a	C1b	D1	E1	G1a	G1b	H1a	H1b	I1
swc	S7874*		32	27	59	113	86	56	78	<---------- NOT MEASURED ----------										
swc	S7874d*		16	10	25	46	36	20	31	<---------- NOT MEASURED ----------										
swc	S7880*		11	11	25	48	55	27	49	<---------- NOT MEASURED ----------										
swc	S7900*		68	79	183	412	234	224	204	<---------- NOT MEASURED ----------										
swc	S7905*		132	133	73	109	81	51	72	<---------- NOT MEASURED ----------										
core	S7987	2.366,58	<---------- NO IDENTIFICATION/QUANTIFICATION POSSIBLE ----------																	
core	S7969	2.366,90	<---------- NO IDENTIFICATION/QUANTIFICATION POSSIBLE ----------																	
core	S7990	2.376,28	<---------- NO IDENTIFICATION/QUANTIFICATION POSSIBLE ----------																	
swc	S7918	2.450,00	<---------- NO IDENTIFICATION/QUANTIFICATION POSSIBLE ----------																	
swc	S7882	1.571,50	2925	1935	638	1281	1126	819	901	1422	1588	395	666	990	1183	266	1452	305	1008	269
core	S7397	1.574,30	4768	3395	--- NO IDENT./QUANT. POSSIBLE -->					2915	2351	424	1194	1649	1720	635	3269	906	3704	-
core	S7398	1.574,60	1902	1783	--- NO IDENT./QUANT. POSSIBLE -->					3012	2746	591	1123	1747	1598	541	3314	799	1957	577
fmt	S7993	1.572,70	105	471	215	500	446	244	335	417	307	296	430	825	923	421	1660	344	1156	352
fmt	S8392	1.576,00	2406	1953	821	1427	1240	806	982	1598	1218	255	522	805	690	286	1636	487	824	235
fmt	S7994	1.588,80	1050	886	584	1269	993	792	857	569	533	409	653	1088	1517	471	2677	375	1790	454
dst1a	S7995		1725	923	365	635	584	407	418	384	349	151	247	378	369	119	558	216	333	97
dst1a+1b	S7996		2190	1445	476	832	785	545	609	517	500	174	300	500	519	196	706	299	431	148
dst2	S7997		960	667	221	378	369	247	282	206	204	84	126	199	191	65	261	95	210	59
Standard:	Bulgaria		371	309	427	1336	809	910	862	174	143	166	143	480	488	502	658	247	655	328
			854	720	934	2907	1693	1868	1733	377	478	299	308	1026	1016	960	1332	611	1247	601

* = measured on GCMS of whole EOM

APPENDIX 10.

DATAREPORT ON STABLE ISOTOPES, GAS SAMPLES FROM WELL 7128/4-1 REPORT IFE/KR/F-94/091

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SUMMARY

Five gas samples from well 7128/4-1 were received and analysed during May and June 1994.

On the samples C_1 - C_5 and CO_2 are quantified. The $\delta^{13}C$ value is measured on methane, ethane, propane, the butanes and CO_2 . In addition the δD value is measured on methane.

DISTRIBUTION

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1 INTRODUCTION

Five gas samples from well 7128/4-1; 2 FMT samples, one without any identification and one from 1576 m, in addition to 3 DST samples, 1 - 1A, 1A + 1B and DST 2 were received and analysed during May and June 1994.

On the samples C_1 - C_5 and CO_2 are quantified. The $\delta\ ^{13}C$ value is measured on methane, ethane, propane, the butanes and CO_2. In addition the δ D value is measured on methane.

2 ANALYTICAL PROCEDURE

The natural gas samples have been quantified and separated into the different gas components by a Carlo Erba 4200 gas chromatograph.

The hydrocarbon gas components were oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products CO_2 and H_2O were frozen into collection vessels and separated.

The combustion water was reduced with zinc metal in a sealed quarts tube to prepare hydrogen for isotopic analysis. The isotopic measurements were performed on a Finnigan MAT 251 and Finnigan Delta mass spectrometer.

IFEs value on NBS 22 is 29.77 ± .06‰ PDB.

3 RESULTS

The volume composition of the gas samples is given in Table 1. The results have been normalised to 100%. The stable isotope results are given in Table 2.

The uncertainty on the $\delta\ ^{13}C$ value is estimated to be ± 0.3‰ PDB and includes all the different analytical steps. The uncertainty in the δ D value is likewise estimated to be ± 5‰.

The $\delta\ ^{13}C$ values of methane, ethane, propane and n-butane from the sample without any identification, sample 1576 m, DST 1-1A and DST 1A & 1B are plotted in James maturity diagram (James, 1983), Figure 1. The molecular composition related to carbon isotope

variations in methane from the same four samples are plotted in Figure 2 (Schoell, 1983), the carbon and hydrogen variations in methane in Figure 3 (Schoell, 1983) and the carbon isotope variations in ethane related to the carbon isotope variations in methane in Figure 4 (Schoell, 1983).

Prior to the present analysis the analytical system for isotope analysis of natural gases was tested with several gas standard mixtures. The isotope values of the standard mixtures are within what can be expected.

The DST 2 sample contained less gas than the other samples in addition to lower concentrations of the different hydrocarbons. The isotope analysis of this sample was performed in the beginning of June and was repeated about 4 weeks later. The results from both analysis are included in the table. The results indicate that "something" has happened with the sample during the storage. Most probably this can be a leakage.

Table 1: Volume composition of gas samples from well 7128/4-1.

Sample	IFE no	C_1 %	C_2 %	C_3 %	iC_4 %	nC_4 %	iC_5 %	nC_5 %	CO_2 %	ΣC_1-C_5	Wet-ness	iC_4/ nC_4/
7128/4-1	13846	92.9	3.9	1.5	0.30	0.5	0.17	0.14	0.6	99.4	0.07	0.58
7128/4-1, 1576m	13847	89.5	6.7	2.3	0.34	0.5	0.12	0.10	0.4	99.6	0.10	0.70
7128/4-1, 9.02.94, DST 1-1A	13848	92.3	4.0	1.8	0.44	0.7	0.22	0.20	0.3	99.7	0.07	0.59
7128/4-1, 10.02.94, DST 1A & 1B	13849	91.8	4.4	1.8	0.40	0.8	0.23	0.22	0.4	99.6	0.08	0.53
7128/4-1, 17.02.94, DST 2	13850	78.9	9.3	4.9	1.3	2.2	0.94	0.91	1.5	98.5	0.20	0.57

Table 2: Isotopic composition of gas samples from well 7128/4-1.

Sample	IFE no	C_1 $\delta^{13}C$ ‰ PDB	C_1 δD ‰ SMOW	C_2 $\delta^{13}C$ ‰ PDB	C_3 $\delta^{13}C$ ‰ PDB	iC_4 $\delta^{13}C$ ‰ PDB	nC_4 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{13}C$ ‰ PDB	CO_2 $\delta^{18}O$ ‰ PDB
7128/4-1	13846	-37.7	-199	-29.5	-27.5	-25.0	-26.6	-7.7	-4.2
7128/4-1, 1576m	13847	-31.4	-172	-26.9	-26.5	-25.0	-25.7	-6.8	-6.0
7128/4-1, 9.02.94, DST 1-1A	13848	-36.7	-188	-27.2	-26.3	-24.2	-25.9	1.0	-5.6
7128/4-1, 10.02.94, DST 1A & 1B	13849	-37.8	-201	-29.9	-27.6	-25.3	-27.0	2.7	-6.9
7128/4-1, 17.02.94,	13850	26.1	nd	-27.7	-23.2	-26.2	nd	-10.4	-5.9
DST 2		48.4	nd	-6.7	-17.1	-20.1	-21.8	-5.8	-3.6

nd - not determined

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