REPORT TITLE/ TITTEL

ANALYSIS OF OILS, CORES AND COAL SAMPLES FROM 34/10-17. CORRELATION OF OILS, OIL SHOWS AND COAL SAMPLES FROM 34/10-16 AND 34/10-17.

CLIENT/ OPPDRAGSGIVER

Statoil

RESPONSIBLE SCIENTIST/ PROSJEKTANSVARLIG

Liv Schou

AUTHORS/ FORFATTERE

L.Schou, P.B. Hall, T. Vinge and E. Hustad

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10.10.83	05.0180/3/83	42	-

IKU

INSTITUTT FOR KONTINENTALSOKKELUNDERSØKELSER

CONTINENTAL SHELF INSTITUTE, NORWAY

Håkon Magnussons gt. 1B — N-7000 Trondheim — Norway — Telephone (07) 91 56 60 — Telex 55434

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INSTITUTT FOR KONTINENTALSOKKELUNDERSØKELSER

CONTINENTAL SHELF INSTITUTE

Håkon Magnussons gt. 1B — N-7000 Trondheim — Telephone (075) 15 660 — Telex 55548

REPORT TITLE/ TITTEL

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SUMMARY/ SAMMENDRAG

The report includes extraction, GC and GC-MS data for 3 oils, 4 sandstone cores and 5 coal samples from 34/10-17. These data together with data from 34/10-16 are used in an attempt to correlate oils, oil shows and coal samples. Two types of oils were seen, one light condensate and one heavier paraffinic type. The biomarker distribution was seen to be fairly similar in all samples, indicating that one main source may be responsible for the generation. The coal is not the source.

KEY WORDS/ STIKKORD

Oil show	Oils
Coal	Correlation

095/F/jbl/21

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FIGURES

EXPERIMENTAL

Extractable Organic Matter

Approximately 50gm of powdered rock was extracted by a ultrasonic probe for 3 minutes using dichloromethane (DCM) as solvent. The DCM used was of organic geochemical grade and blank analyses showed the occurrence of negligible amounts of contaminating hydrocarbons.

Activated copper fillings were used to remove any free sulphur from the samples.

After extraction the solvent was removed on a Buchi Rotavapor and the amount of extractable organic matter (EOM) was determined.

Chromatographic Separation

The extractable organic matter (EOM) was separated into saturated fraction, aromatic fraction and non hydrocarbon fraction using a MPLC system with hexane as eluant (Radke et al., Anal. Chem., 1980). The various fractions were evaporated on a Buchi Rotavapor and transferred to glass vials and dried in stream of nitrogen. The 3 oils were separated using the same system.

Gas Chromatographic Analysis

The saturated hydrocarbon fractions were each diluted with n-hexane and analysed on a HP 5730A gas chromatograph, fitted with a 25m OV-101 fused silica capillary column. Hydrogen (0.7ml/min) was used as carrier gas. The aromatic fractions were after dilution with n-hexane, analysed on a Carlo Erba Fractovap Series 2150 GC fitted with a 20mm SE-54 fused silica column.

Injections on both systems were performed in the split mode (1:20). The temperature program applied was 80^{o}C (2 min) to 260^{o}C at 4^{o}C/min.

In addition the whole oils were analysed by hydrogen stripping for their content of light hydrocarbons (C_2-C_8). The GC used was a Carlo Erba Fractovap fitted with a 45m SCOT column coated with Squalane. The temperature program applied was 60^{o}C.

The data processing for all the GC analyses was performed on a VG Multichrom System.

Gas chromatography - mass spectrometry (GC-MS)

GC-MS analyses were performed on a VG Micromass 70-70H GC-MS-DS system. The Varian Series 3700 GC was fitted with a fused silica OV-1 capillary column (30m x 0.3mm i.d.). Helium ($0.7kg/cm^2$) was used as carrier gas and the injections were performed in splitless mode (1.5µl). The GC oven was programmed from 70^oC to 280^oC at 4^oC/min. after an initial isothermal period of 2 minutes.

The saturated hydrocarbons were analysed in multiple ion mode (MID) at a scan cycle time of approximately 2 secs. Full data collection was applied for the aromatic hydrocarbons at a scan time of 1 sec/decade. The mass spectrometer operated at 70eV electron energy and an ion source temperature of 200^oC. Data acquisition was done by a GC data system.

Peak identification was performed applying knowledge of elution patterns in certain mass chromatograms. Calculation of peak ratios was done from peak height in the appropriate mass chromatograms.

An internal standard, with a prominent m/e 191 ion in the mass spectrum (Masspec Analytical), was applied in the calculation of absolute concentrations. The standard was added prior to the extraction.

CORRELATION OF OIL SHOWS AND OILS WITH COAL SAMPLES FROM WELL 34/10-16 AND 34/10-17

Table A summarises all GC-MS data obtained on samples from the two wells. Since no claystone samples have been analysed by GC-MS, a correlation can only be performed with the coals. The data suggest there are two types of oils, one light oil/condensate type, represented by the two shallowest oil samples, and one paraffinic type represented by the sample at 2889m in well 34/10-17. This is seen both from the API gravity and the gas chromatograms of the saturated hydrocarbons. The variations in the biomarker ratios are only minor, the most pronounced difference being seen in the molecular weight distribution of C_{27} to C_{29} steranes and of rearranged to regular C_{27} steranes.

A similar trend as for the oils, is seen for the oil shows in the sandstones in both wells. The deepest samples contain more of the high molecular weight components than do the shallower samples. Only small variations are seen in the biomarker ratios, the most pronounced difference being seen in the C_{27} hopanes (B/A). The increased values of B/A for the 34/10-16 samples could be due to lower maturity, or it might reflect a different source for these samples. The bisnorhopane (Z) is found in highest abundance in the two deepest samples in 34/10-16. This compound is also tentatively identified in reduced abundance in the other samples, a fact that may reflect slightly different migration processes. From the sterane mass chromatograms the 4 samples in 34/10-17 seem to be most similar to the shallow 34/10-16 samples and the two light oils. The two deepest samples in 34/10-16 contains more of the C_{29} steranes relative to the C_{27} analogs, than do the other samples.

Since no claystone samples from these two wells have been analysed by GC-MS, only the coal samples can be used in the correlation. Of the 5 samples analysed, only one, at 2800m in 34/10-17, shows chromatograms typical of coal. The chromatograms suggest that the other 4 samples have been "contaminated" by migrated hydrocarbons, probably of the same type as the oil shows. The one representative coal sample is definitely different to the oils shows and oils in both sterane and terpane distributions, and can thus not be the source.

To conclude it might be said that there are two types of oils in 34/10-17, one light oil/condensate type and one heavier paraffinic type. The oils could have been generated from the same source rock, and different maturity and migration processes are responsible for the variations, or two different types of source rocks may have generated the oils. Only minor variations were seen in the oil shows, suggesting they originate from one main source rock. The source rock for the shows could be the same as for the oils.

Of the analysed samples only one coal was found to be representative of a possible source rock. the biomarker distribution of this coal was different to oils, thus implying no correlation.

To be able to perform further source rock/oil correlation in these two wells, we would suggest that a few claystone samples from the sections with the best source rock potential be analysed.

Table A: Summary of GC-MS data of wells 34/10-16 and 34/10-17

34/10-16			TRI/E	B/A	Z/E	X/E	αβ/αβ+βα	%22S	%20S	%ββ	a+b/h+k	h+k/q+r+s+t
A-8250	sst.	3180.35-.42m	0.11	1.1	-	0.11	0.87	61.9	42.7	70.8	0.8	1.3
A-8251	sst.	3240.13-.19m	0.07	1.9	-	0.16	0.83	66.7	47.6	69.3	0.6	1.0
A-8252	sst.	3325.42-.49m	0.63	2.2	0.16	0.14	0.83	60.7	48.8	66.4	0.5	0.6
A-8253	sst.	3355.93-.3356m	0.03	1.8	0.09	0.10	0.88	63.6	49.3	71.8	0.6	0.6
34/10-17												
A-8254	sst.	2685.6-.69m	0.11	0.9	0.05	0.11	0.92	56.3	43.7	77.9	1.1	0.9
A-8263	cond.	2687.5m	0.28	0.7	-	0.17	0.92	56.5	47.6	75.0	1.3	1.6
A-8264	oil	2697m	0.14	0.6	0.07	0.23	0.86	54.8	40.6	73.2	1.2	1.3
A-8255	coal	2717.50m	0.03	2.3	-	0.12	0.75	54.2	26.7	58.3	0.8	0.5
A-8256	coal	2752.95m	0.05	1.7	0.05	0.14	0.84	56.1	33.3	70.3	1.0	1.2
A-8257	sst.	2774.50-.56m	0.23	0.7	0.05	0.14	0.89	58.8	49.1	70.7	1.3	1.3
A-8258	coal	2800.00m	-	23.8	-	0.13	0.64	52.9	29.0	58.7	0.1	0.7
A-8259	sst.	2837.64-.70m	0.14	0.8	0.04	0.19	0.88	57.7	49.2	74.9	1.1	1.2
A-8260	coal	2861.35m	0.08	1.7	0.08	0.14	0.86	61.9	41.6	68.6	1.2	1.0
A-8265	oil	2889m	0.06	0.6	0.05	0.14	0.90	62.5	50.0	75.7	0.9	0.8
A-8261	coal	2904.25m	0.06	0.8	0.10	0.17	0.85	62.3	46.2	69.1	1.1	0.7
A-8262	sst.	2922.93-2933m	0.11	0.4	0.07	0.18	0.91	58.3	43.5	75.2	1.2	1.3

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Table 1: API gravity of oil samples, well 34/10-17

IKU no.	Depth (m)	API
A-8263	2687.5	51.2^{o}
A-8264	2697.0	51.0^{o}
A-8265	2889.0	35.7^{o}

Table 2: Light hydrocarbons C_2-C_8

	A-8263 % of total condensate	A-8264 % of total oil	A-8265 % of total oil
nC_2			0.1
nC_3		0.8	1.0
MC_3		1.3	0.7
nC_4		2.6	1.6
MC_4	0.9	2.6	1.2
nC_5	1.7	2.6	1.4
$2.2DMC_4$	0.2	3.2	0.07
CyC_5 + $2MC_5$	3.1	2.4	1.1
$3MC_5$	1.8	1.3	0.5
nC_6	4.6	2.8	1.3
$MCyC_5$ + $2.4DMC_5$	3.3	2.1	0.9
CyC_6	5.8	3.7	1.5
$2MC_6$ + $3MC_6$	3.8	2.2	0.7
$1cis3DMCyC_5$	1.1	0.6	0.2
$1tr3DMCyC_5$	1.1	0.5	0.2
$2.2.4TMC_5$	1.5	0.9	0.3
nC_7	6.1	3.4	1.2
benzene	11.0	6.2	2.5
$2.2DMC_6$	0.7	0.3	0.1
$1.2DMCyC_5$	0.6	0.4	0.09
$2.4DMC_6$	0.4	0.2	0.07
MC_7	3.6	2.0	0.6
CyC_7	6.4	3.6	1.1
toluene	5.4	2.6	1.1

Abbreviations:

nC_2	ethane
nC_3	propane
MC_3	methyl-propane
nC_4	butane
MC_4	methyl-butane
nC_5	pentane
$2.2DMC_4$	2.2 dimethyl-butane
CyC_5 + $2MC_5$	cyclopentane + 2 methyl-pentane
$3MC_5$	3 methylpentane
nC_6	hexane
$MCyC_5$ + $2.4DMC_5$	methylcyclopentane + 2.4 dimethylpentane
CyC_6	cyclohexane
$2MC_6$ + $3MC_6$	2 methylhexane + 3 methyl-hexane
$1cis3DMCyC_5$	1cis 3 dimethylcyclopentane
$1tr3DMCyC_5$	1 trans 3 dimethylcyclopentane
$2.2.4TMC_5$	2.2.4 trimethyl-pentane
nC_7	heptane
$1.2DMCyC_5$	1.2 dimethylcyclopentane
$2.2DMC_6$	2.2 dimethylhexane
$2.4DMC_6$	2.4 dimethylhexane
MC_7	methylheptane
CyC_7	cycloheptane

IKU

TABLE : 3.1

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

Well 34/10-17 Oil samples

IKU-No	DEPTH (m)	Rock Extr. (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)
A 8263	2687.50	269.9	190.6	44.5	7.6	52.1	138.5
A 8264	2697	386.1	262.8	122.6	20.8	143.4	119.4
A 8265	2889	265.8	239.3	115.2	30.2	145.4	93.9

DATE : 30 - 9 - 83.

IKU

TABLE : 3.2

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm OF crude oil)

Well 34/10-17

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
A 8263	2687.50	706	165	28	193	513
A 8264	2697	681	318	54	371	309
A 8265	2889	900	433	114	547	353

DATE : 30 - 9 - 83.

IKU

TABLE : 3.3

COMPOSITION IN % OF MATERIAL EXTRACTED FROM THE OIL

Well 34/10-17

IKU-No	DEPTH (m)	Sat / EOM	Aro / EOM	HC / EOM	SAT / Aro	Non HC / EOM	HC / Non HC
A 8263	2687.50	23.3	4.0	27.3	585.5	72.7	37.6
A 8264	2697	46.7	7.9	54.6	589.4	45.4	120.1
A 8265	2889	48.1	12.6	60.8	381.5	39.2	154.8

DATE : 30 - 9 - 83.

Table 3.4: Weights of NSO and asphaltene fractions
Well 34/10-17, Oil samples

IKU no.	Depth	NSO (mg)	Asphaltenes (mg)
A-8263	2687.5	3.4	-
A-8264	2697	10.5	-
A-8265	2889	45.4	0.8

IKU

T A B L E : 4.1

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

Well 34/10-17; Core and coal samples

IKU-No	DEPTH (m)	Rock Extr. (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
A 8254	2685.56 -.69	95.5	325.4	64.7	14.2	78.9	246.5	0.15
A 8257	2774.50 -.56	94.9	265.8	56.4	11.6	68.0	197.8	0.25
A 8259	2837.64 -.70	100.9	290.2	36.0	4.9	40.9	249.3	0.22
A 8262	2922.93 -3.00	97.1	554.6	417.2	52.1	469.3	85.3	0.44
A 8255	2717.50	4.0	92.8	12.1	20.0	32.1	60.7	52.22
A 8256	2752.95	5.1	113.4	13.2	24.5	37.7	75.7	62.99
A 8258	2800.00	15.1	55.4	8.6	10.3	18.9	36.5	38.28
A 8260	2861.35	11.7	318.0	50.9	63.7	114.6	203.4	70.95
A 8261	2904.25	10.6	352.1	32.2	65.8	98.0	254.1	60.16

DATE : 4 - 10 - 83.

IKU

T A B L E : 4.2

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm OF rock)

Well 34/10-17

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
A 8254	2685.56 -.69	3407	677	149	826	2581
A 8257	2774.50 -.56	2801	594	122	717	2084
A 8259	2837.64 -.70	2876	357	49	405	2471
A 8262	2922.93 -3.00	5712	4297	537	4833	878
A 8255	2717.50	23200	3025	5000	8025	15175
A 8256	2752.95	22235	2588	4804	7392	14843
A 8258	2800.00	3669	570	682	1252	2417
A 8260	2861.35	27179	4350	5444	9795	17385
A 8261	2904.25	33217	3038	6208	9245	23972

DATE : 4 - 10 - 83.

IKU

T A B L E : 4.3

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

Well 34/10-17

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
A 8254	2685.56 -.69	2271.6	451.7	99.1	550.8	1720.8
A 8257	2774.50 -.56	1120.3	237.7	48.9	286.6	833.7
A 8259	2837.64 -.70	1307.3	162.2	22.1	184.3	1123.1
A 8262	2922.93 -3.00	1298.1	976.5	121.9	1098.4	199.7
A 8255	2717.50	44.4	5.8	9.6	15.4	29.1
A 8256	2752.95	35.3	4.1	7.6	11.7	23.6
A 8258	2800.00	9.6	1.5	1.8	3.3	6.3
A 8260	2861.35	38.3	6.1	7.7	13.8	24.5
A 8261	2904.25	55.2	5.0	10.3	15.4	39.8

DATE : 4 - 10 - 83.

IKU

TABLE : 4.4

COMPOSITION IN % OF MATERIAL EXTRACTED FROM THE ROCK

Well 34/10-17

IKU-No	DEPTH (m)	Sat / EOM	Aro / EOM	HC / EOM	SAT / Aro	Non HC / EOM	HC / Non HC
A 8254	2685.56 -.69	19.9	4.4	24.2	455.6	75.8	32.0
A 8257	2774.50 -.56	21.2	4.4	25.6	486.2	74.4	34.4
A 8259	2837.64 -.70	12.4	1.7	14.1	734.7	85.9	16.4
A 8262	2922.93 -3.00	75.2	9.4	84.6	800.8	15.4	550.2
A 8255	2717.50	13.0	21.6	34.6	60.5	65.4	52.9
A 8256	2752.95	11.6	21.6	33.2	53.9	66.8	49.8
A 8258	2800.00	15.5	18.6	34.1	83.5	65.9	51.8
A 8260	2861.35	16.0	20.0	36.0	79.9	64.0	56.3
A 8261	2904.25	9.1	18.7	27.8	48.9	72.2	38.6

DATE : 4 - 10 - 83.

Table 4.5: Weights of NSO and asphaltene fractions
Well 34/10-17 Core and coal samples

IKU No.	Depth	NSO (mg)	Asphalthenes (mg)
A-8254	2685.56-.69	4.3	0.2
A-8257	2774.50-.56	4.1	-
A-8259	2837.64-.70	5.8	0.5
A-8262	2922.93-2923.00	20.2	0.8
A-8255	2717.50	14.3	3.8
A-8256	2752.95	5.2	6.9
A-8258	2800.00	8.2	1.8
A-8260	2861.35	44.5	6.8
A-8261	2904.25	48.6	29.6

T A B L E 5.

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

Well 34/10-17, Oil samples

IKU No.	DEPTH (m)	PRISTANE / n-C17	PRISTANE / PHYTANE	CPI
A 8263	2687.50	0.5	2.3	0.9
A 8264	2697	0.5	2.3	1.0
A 8265	2889	0.4	1.0	1.1

DATE : 4 - 10 - 83.

IKU

T A B L E 6.

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

Well 34/10-17

IKU No.	DEPTH (m)	PRISTANE / n-C17	PRISTANE / PHYTANE	CPI
A 8254	2685.56 -.69	0.5	2.1	1.0
A 8257	2774.50 -.56	0.5	2.1	1.0
A 8259	2837.64 -.70	0.5	2.0	1.0
A 8262	2922.93 -3.00	0.5	2.0	1.0
A 8255	2717.50	0.4	2.0	1.0
A 8256	2752.95	0.4	2.1	1.0
A 8258	2800.00	1.3	4.4	1.6
A 8260	2861.35	0.4	2.0	1.0
A 8261	2904.25	0.4	2.0	1.0

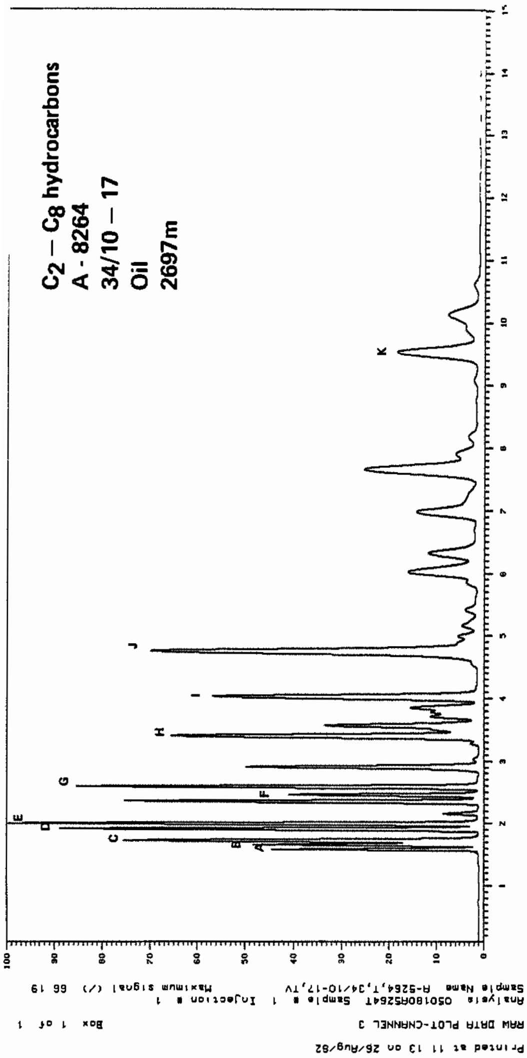
DATE : 4 - 10 - 83.

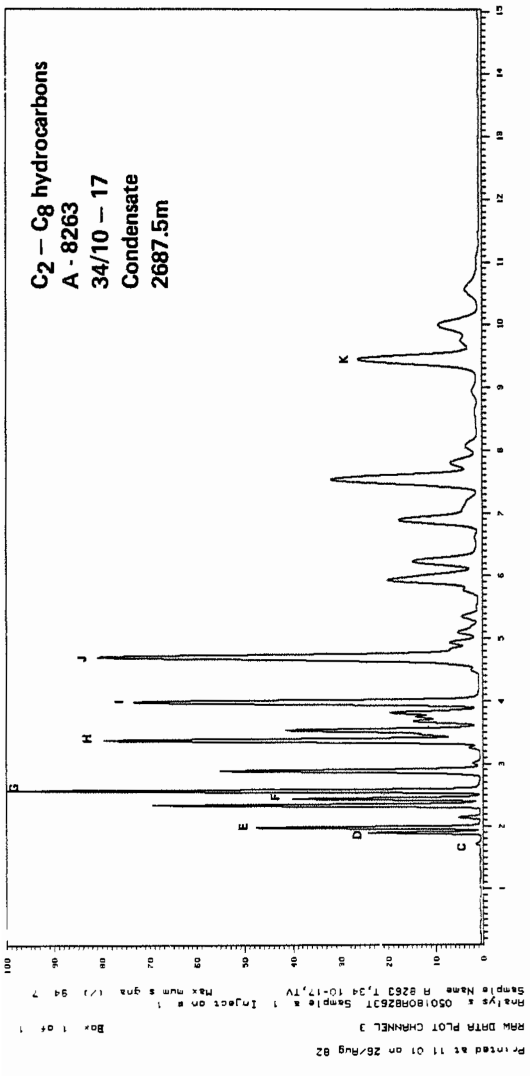
Well 34/10-17

FIGURE 1

Gas chromatograms of light hydrocarbons (C_2-C_8)

A - propane (nC_3)
B - methylpropane (MC_3)
C - butane (nC_4)
D - methylbutane (MC_4)
E - pentane (nC_5)
F - 3-metyl-pentane ($3MC_5$)
G - hexane (nC_6)
H - cyclohexane (CyC_6)
I - heptane (nC_7)
J - benzene + 1,2 $DMCyC_5$
K - toluene


$C_2 - C_8$ hydrocarbons
A - 8264
34/10 – 17
Oil
2697m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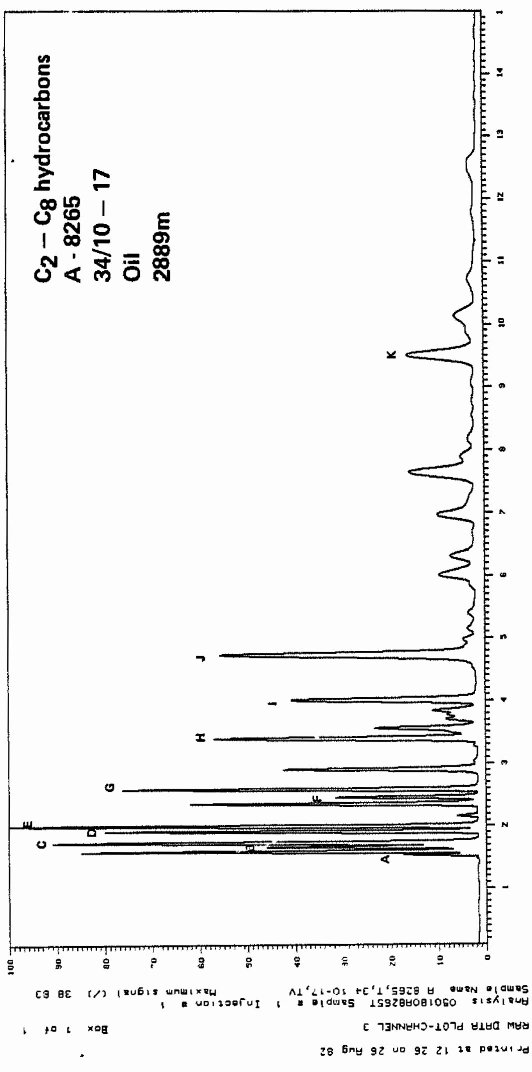
A - 8263
34/10 – 17
Condensate
2687.5m


$C_2 - C_8$ hydrocarbons
A - 8265
34/10 – 17
Oil
2889m

Well 34/10-17

FIGURE 2

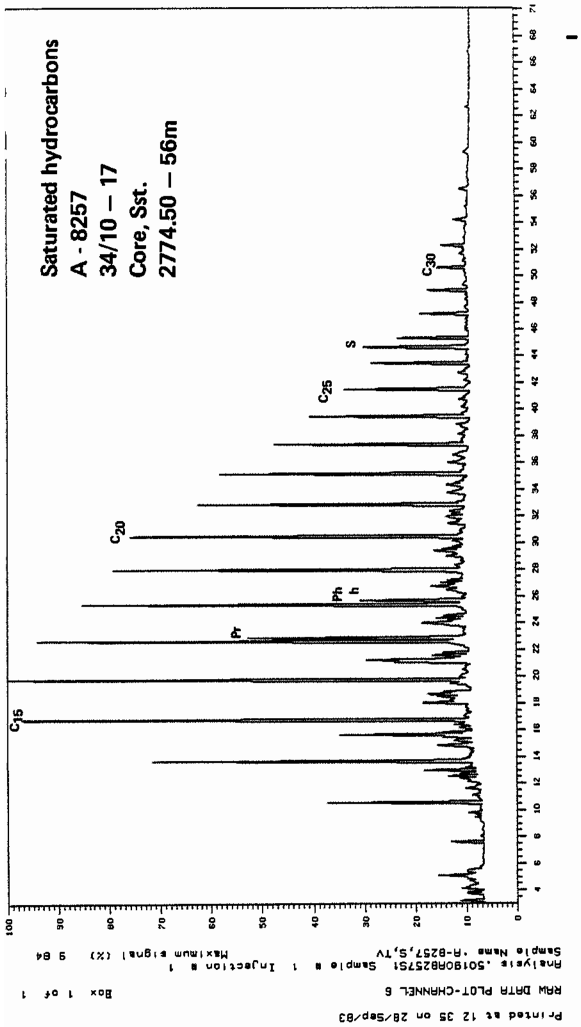
GC of saturated hydrocarbons

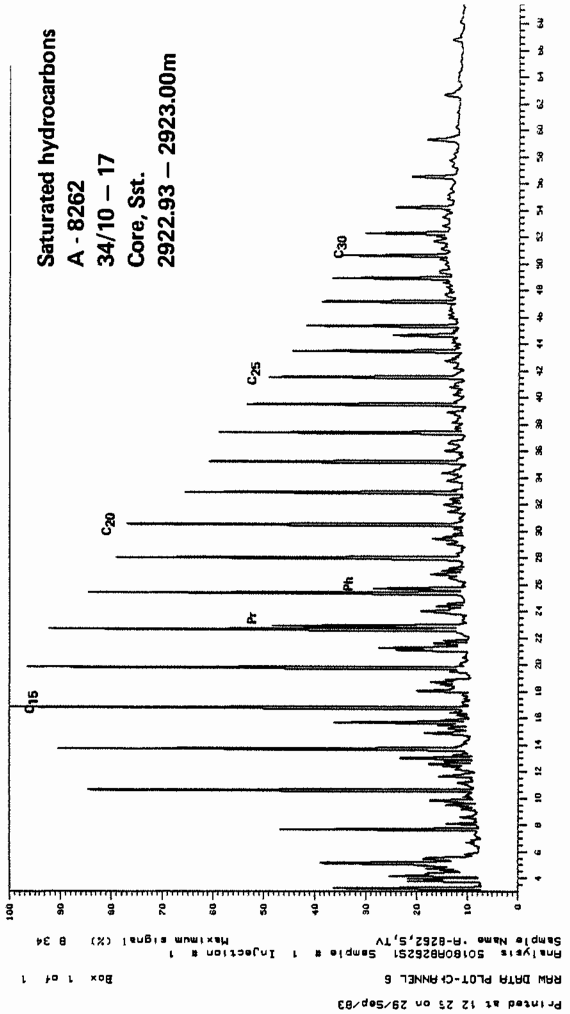
Pr - pristane

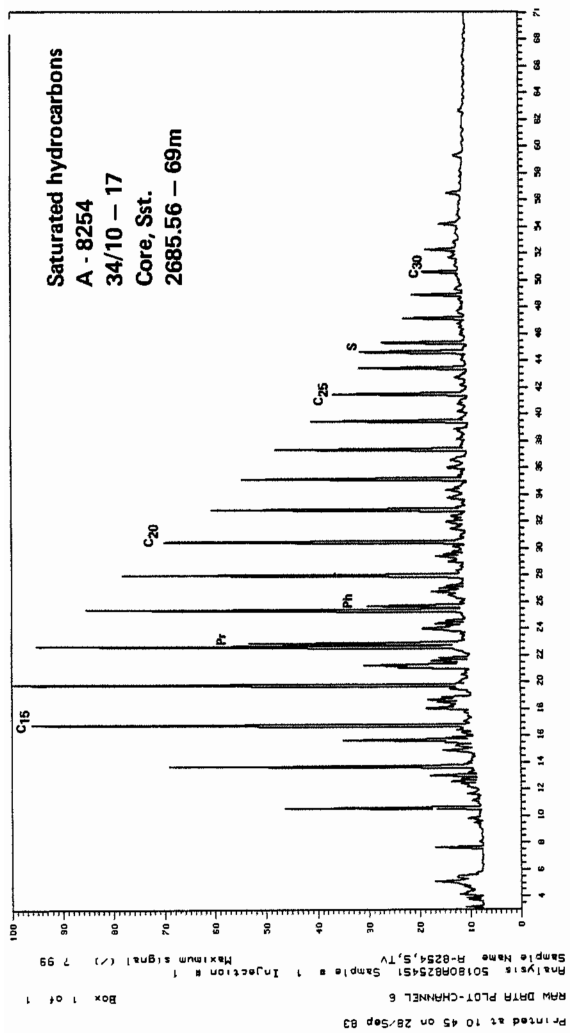
Ph - phytane

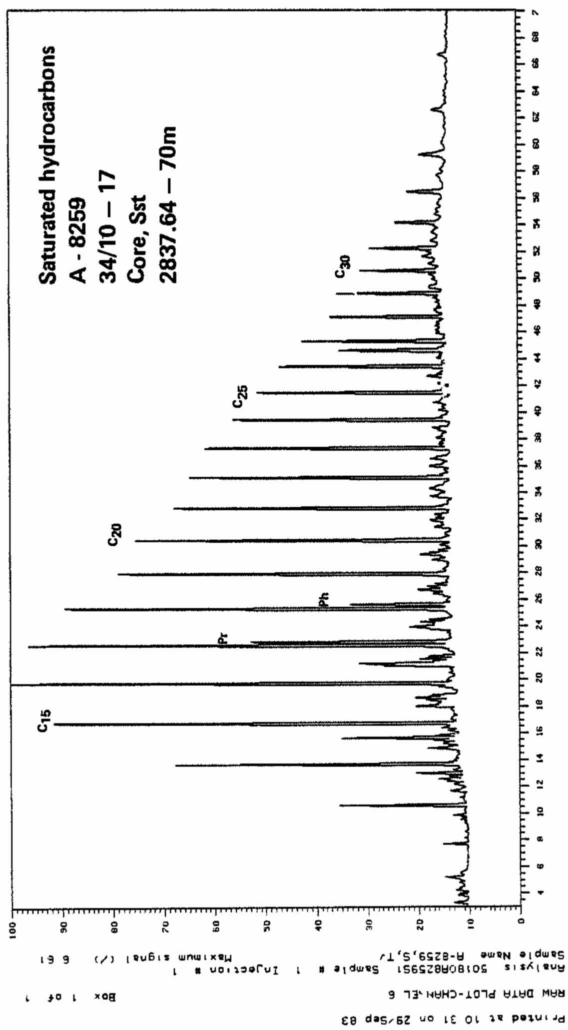
C_{15}-C_{30} normal alkanes

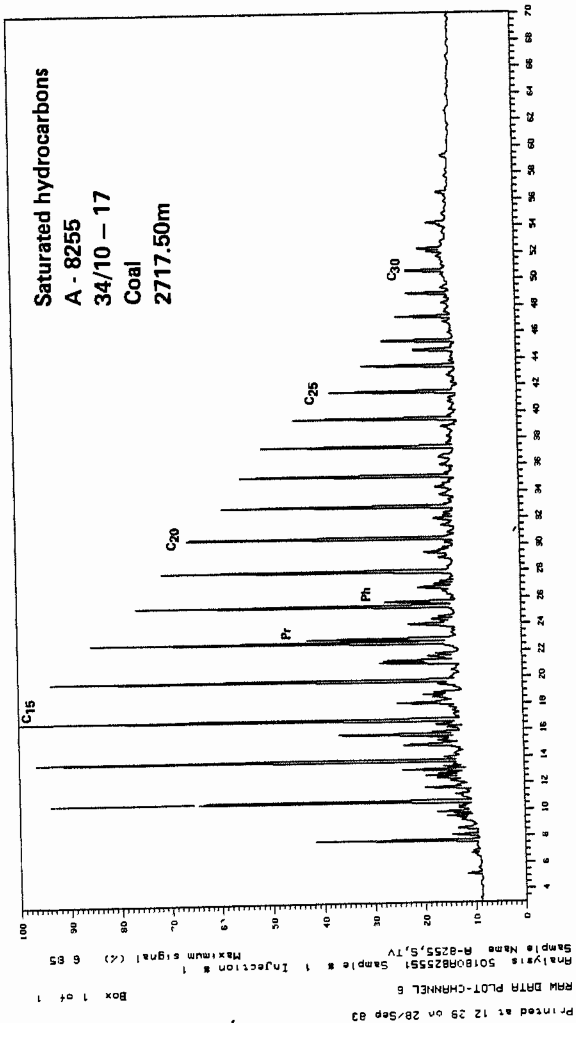
S - squalane (internal standard)

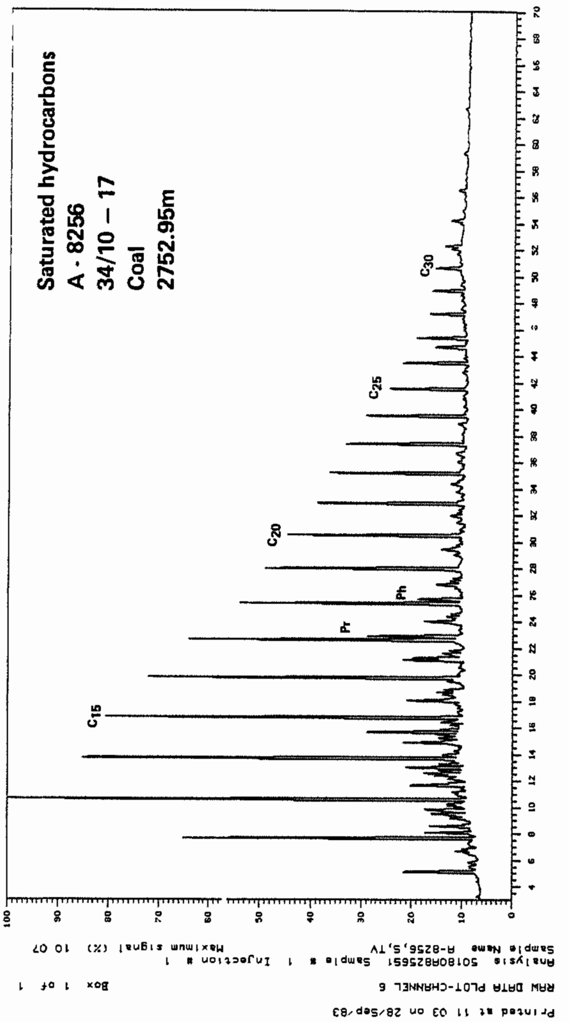

Saturated hydrocarbons
A - 8257
34/10 – 17
Core, Sst.
2774.50 – 56m
C15
Pr
Ph
C20
C25
S
C30
Printed at 12 35 on 28/Sep/83
RAW DATA PLOT-CHANNEL 6

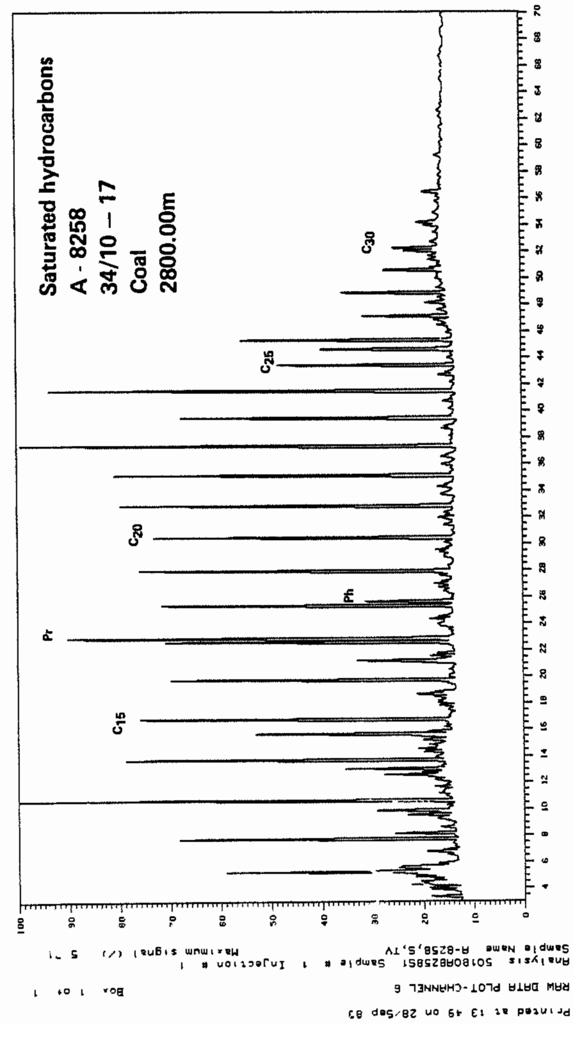

Saturated hydrocarbons
A - 8262
34/10 – 17
Core, Sst.
2922.93 – 2923.00m
C15
Pr
Ph
C20
C25
C30
Printed at 12 25 on 29/Sep/83
RAW DATA PLOT-CHANNEL 6

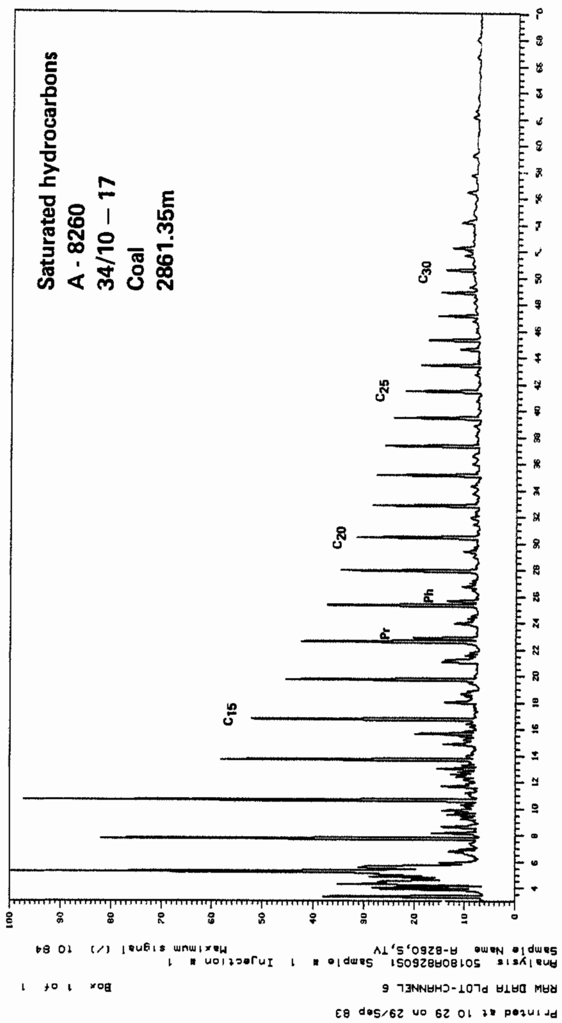

Saturated hydrocarbons
A - 8254
34/10 – 17
Core, Sst.
2685.56 – 69m
C15
Pr
Ph
C20
C25
S
C30
Printed at 10 45 on 28/Sep 83
RAW DATA PLOT-CHANNEL 6

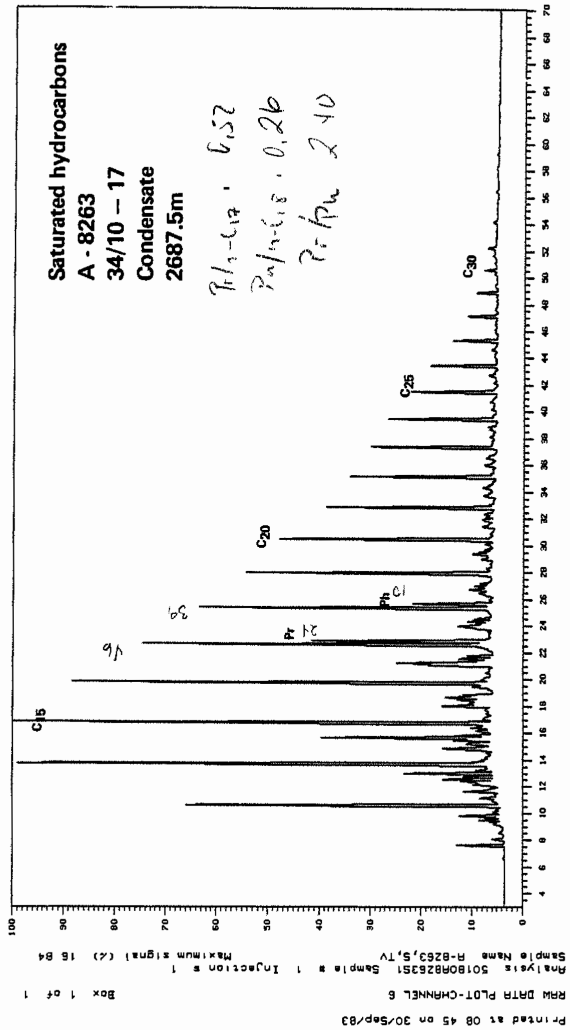

Saturated hydrocarbons
A - 8259
34/10 – 17
Core, Sst
2837.64 – 70m
C15
Pr
Ph
C20
C25
C30
Printed at 10 31 on 29/Sep 83

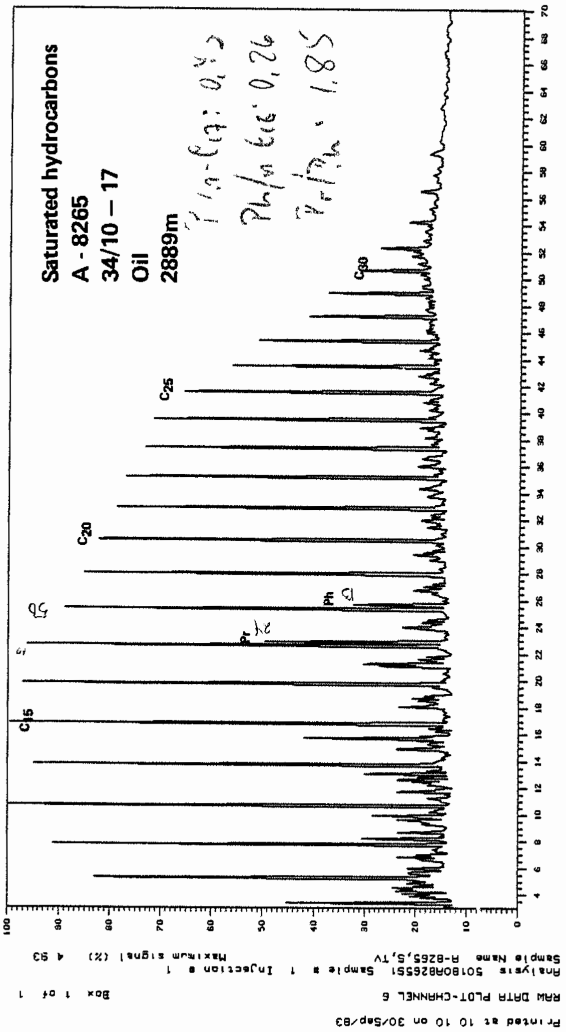

Saturated hydrocarbons
A - 8255
34/10 – 17
Coal
2717.50m
C_{15}
Pr
Ph
C_{20}
C_{25}
C_{30}

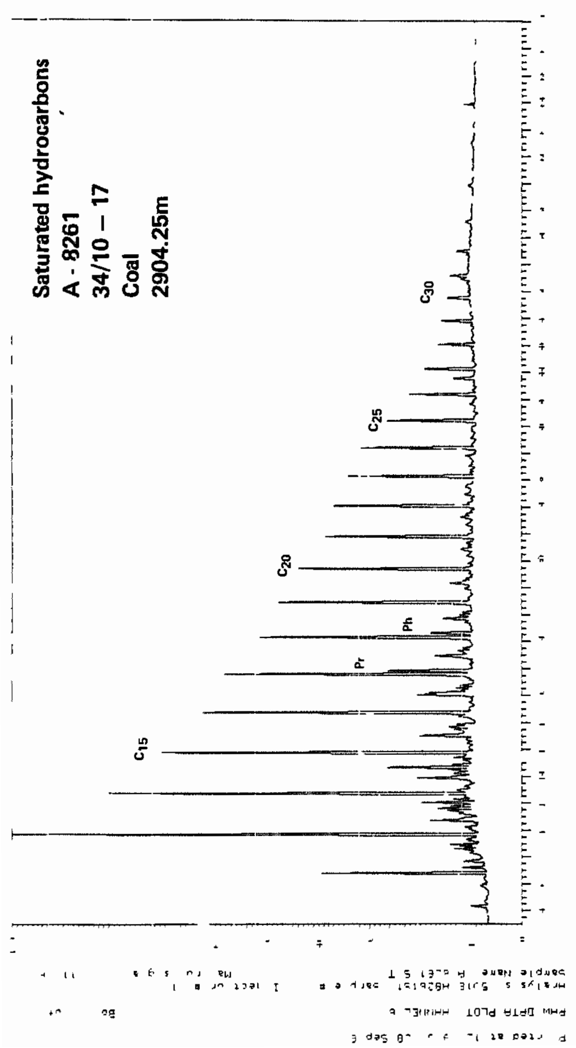

Saturated hydrocarbons
A - 8256
34/10 – 17
Coal
2752.95m
C_{15}
Pr
Ph
C_{20}
C_{25}
C_{30}

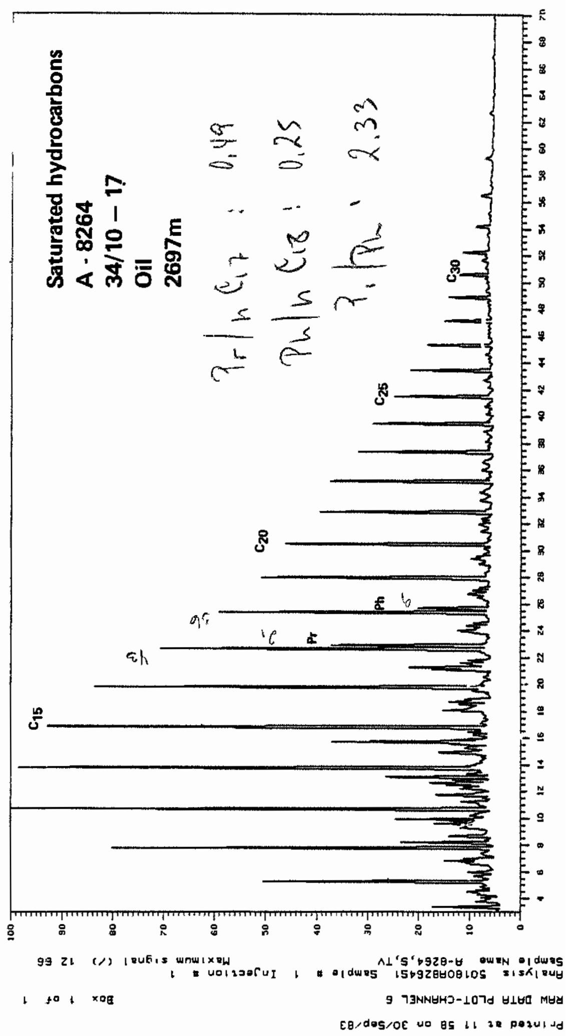

Saturated hydrocarbons
A - 8258
34/10 – 17
Coal
2800.00m
C_{15}
Pr
Ph
C_{20}
C_{25}
C_{30}


Saturated hydrocarbons
A - 8260
34/10 – 17
Coal
2861.35m
C_{15}
Pr
Ph
C_{20}
C_{25}
C_{30}


Saturated hydrocarbons
A - 8263
34/10 – 17
Condensate
2687.5m
C15
Pr
Ph
C20
C25
C30


Saturated hydrocarbons
A - 8265
34/10 – 17
Oil
2889m
C15
Pr
Ph
C20
C25
C30


Saturated hydrocarbons
A - 8261
34/10 – 17
Coal
2904.25m
C15
Pr
Ph
C20
C25
C30

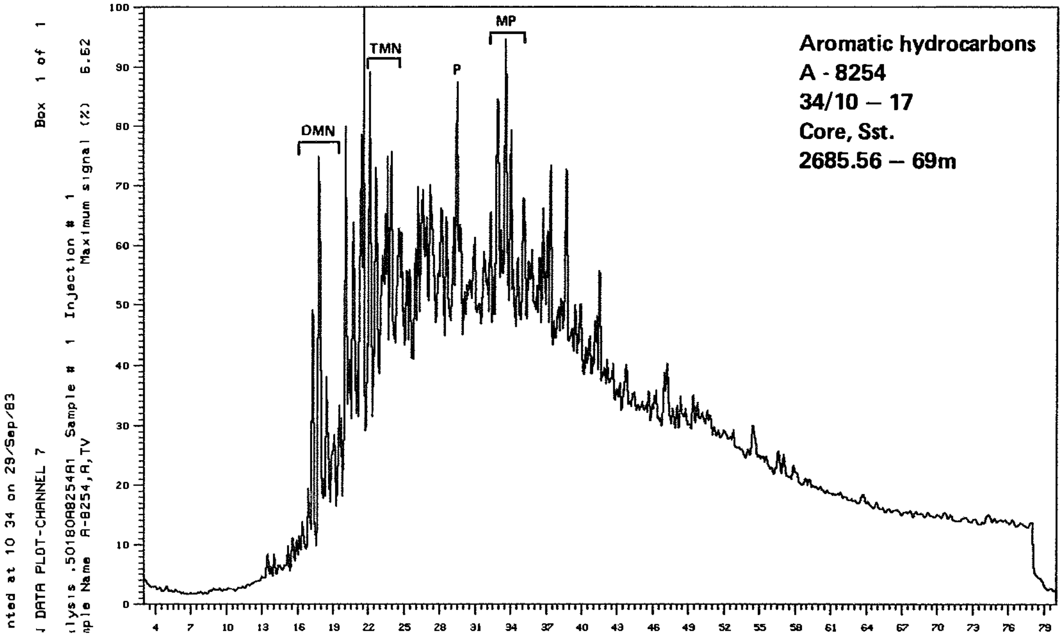

Saturated hydrocarbons
A - 8264
34/10 – 17
Oil
2697m
C15
Pr
Ph
C20
C25
C30

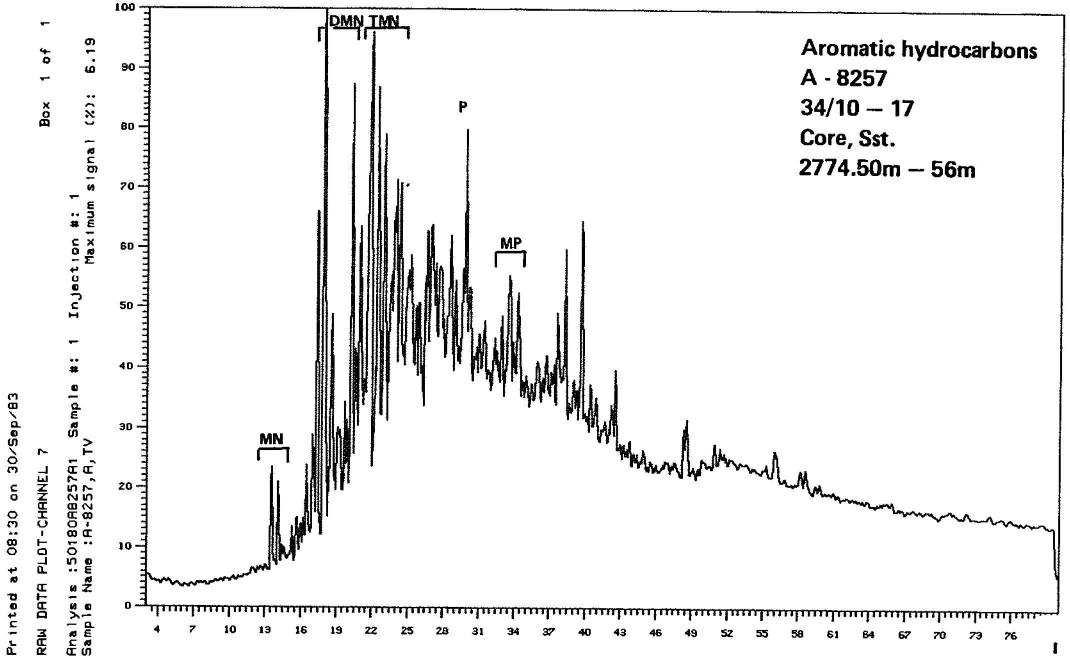
Well 34/10-17

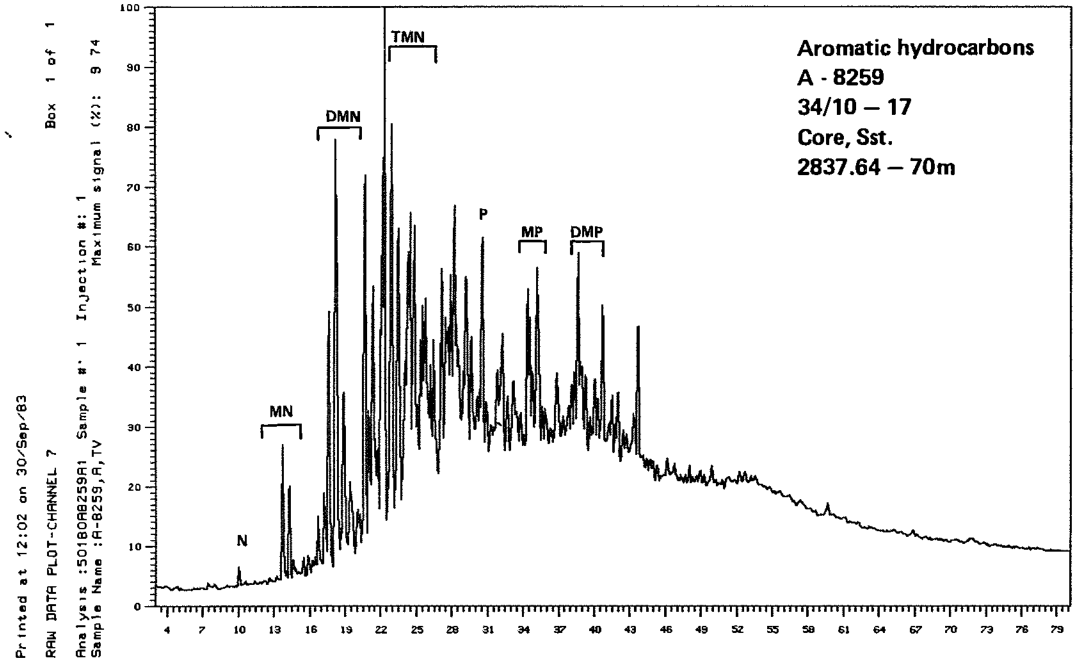
FIGURE 3

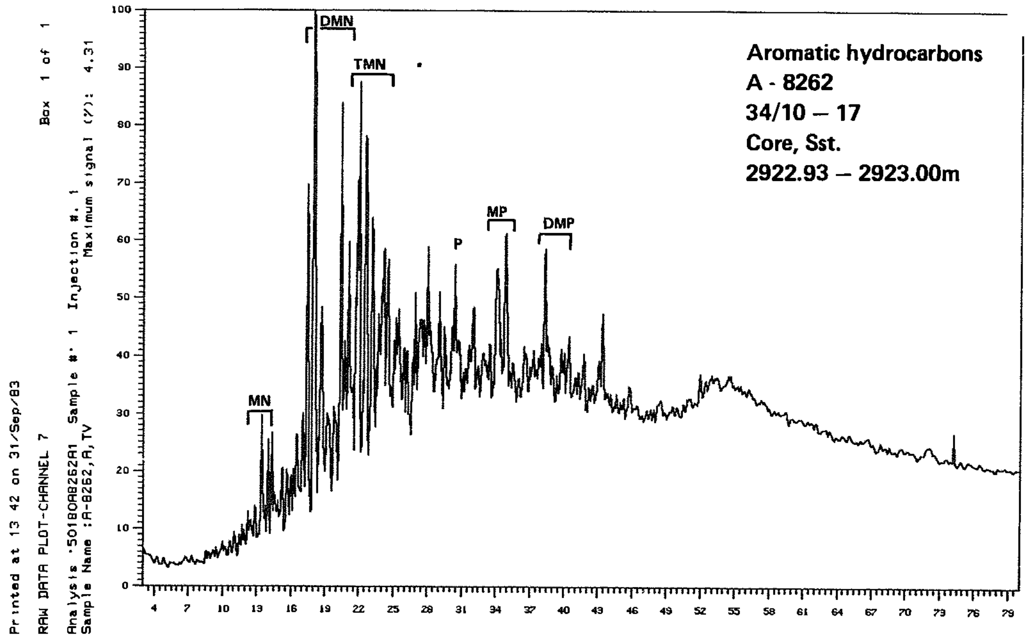
GC of aromatic hydrocarbons

N - naphthalene
MN - C_1-naphthalenes
DMN - C_2-naphthalenes
TMN - C_3-naphthalenes
P - phenanthrene
MP - C_1-phenanthrenes
DMP - C_2-phenanthrenes


Aromatic hydrocarbons
A - 8254
34/10 – 17
Core, Sst.
2685.56 – 69m
DMN
TMN
P
MP
RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Maximum signal (%) 6.62


Aromatic hydrocarbons
A - 8257
34/10 – 17
Core, Sst.
2774.50m – 56m
MN
DMN
TMN
P
MP
Printed at 08:30 on 30/Sep/83
RAW DATA PLOT-CHANNEL 7
Analysis :50180A8257A1 Sample #: 1 Injection #: 1
Sample Name :A-8257,A,TV
Box 1 of 1
Maximum signal (%): 6.19

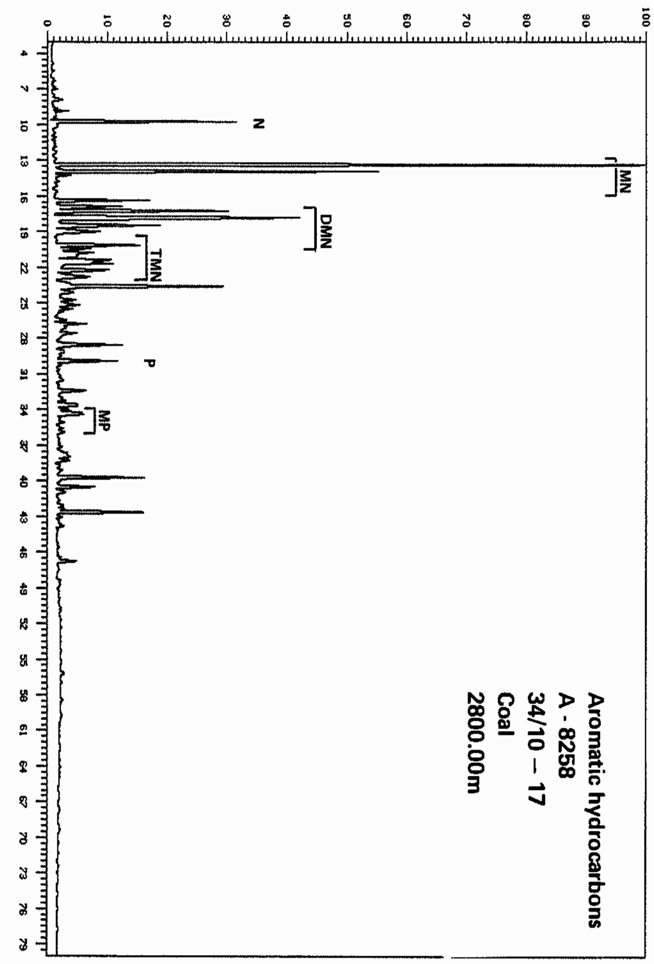

Aromatic hydrocarbons
A - 8259
34/10 – 17
Core, Sst.
2837.64 – 70m
N
MN
DMN
TMN
P
MP
DMP
Printed at 12:02 on 30/Sep/83
RAW DATA PLOT-CHANNEL 7
Analysis :50180A8259A1 Sample #: 1 Injection #: 1
Sample Name :A-8259,A,TV
Box 1 of 1
Maximum signal (%): 9.74


Aromatic hydrocarbons
A - 8262
34/10 – 17
Core, Sst.
2922.93 – 2923.00m
MN
DMN
TMN
P
MP
DMP
Printed at 13 42 on 31/Sep/83
RAW DATA PLOT-CHANNEL 7
Analysis :50180A8262A1 Sample #: 1 Injection #: 1
Sample Name :A-8262,A,TV
Box 1 of 1
Maximum signal (%): 4.31

Printed at 10:08 on 30/Sep/83

RAW DATA PLOT-CHANNEL 7 Box 1 of 1

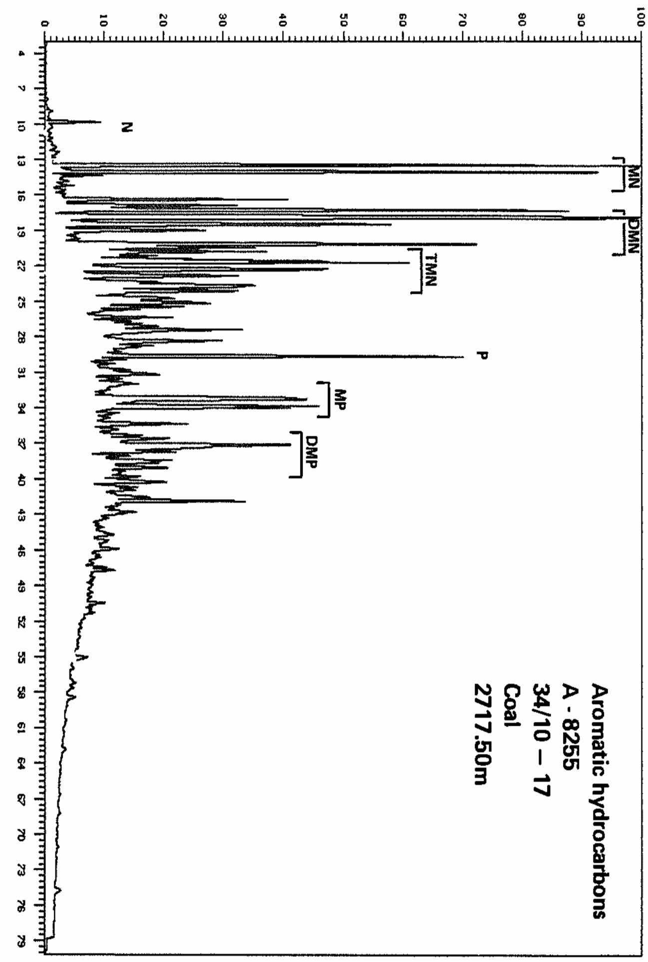
Analysis :50180A8258A1 Sample #: 1 Injection #: 1
Sample Name :A-8258,A,TV Maximum signal (%): 48.03



nted at 12 19 on 29/Sep/83

DATA PLOT-CHANNEL 7 Box 1 of 1

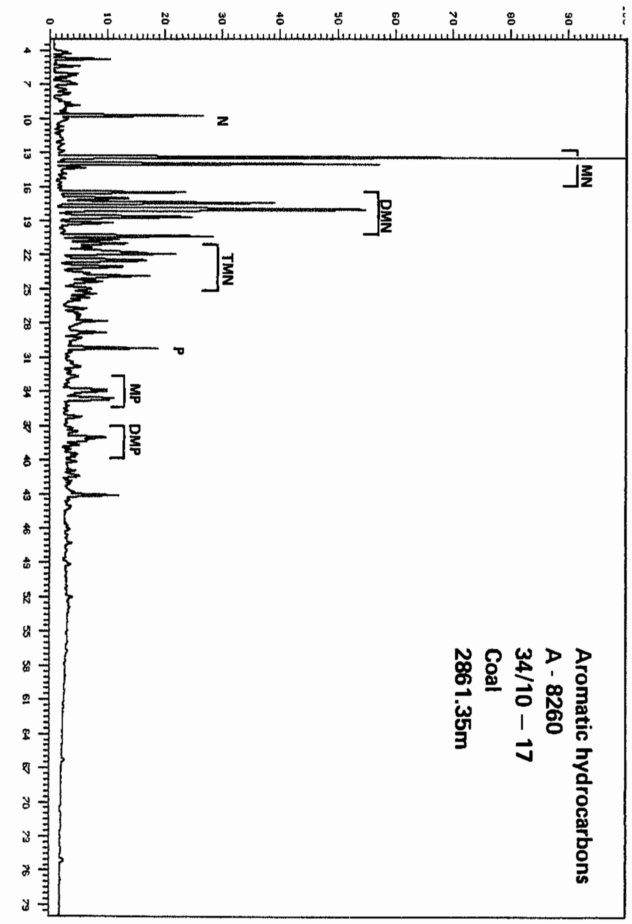
lysis .50180A8255A1 Sample #. 1 Injection #: 1
ple Name .A-8255,A,TV Maximum signal (%):100 00



Printed at 15 10 on 30/Sep/83

RAW DATA PLOT-CHANNEL 7 Box 1 of 1

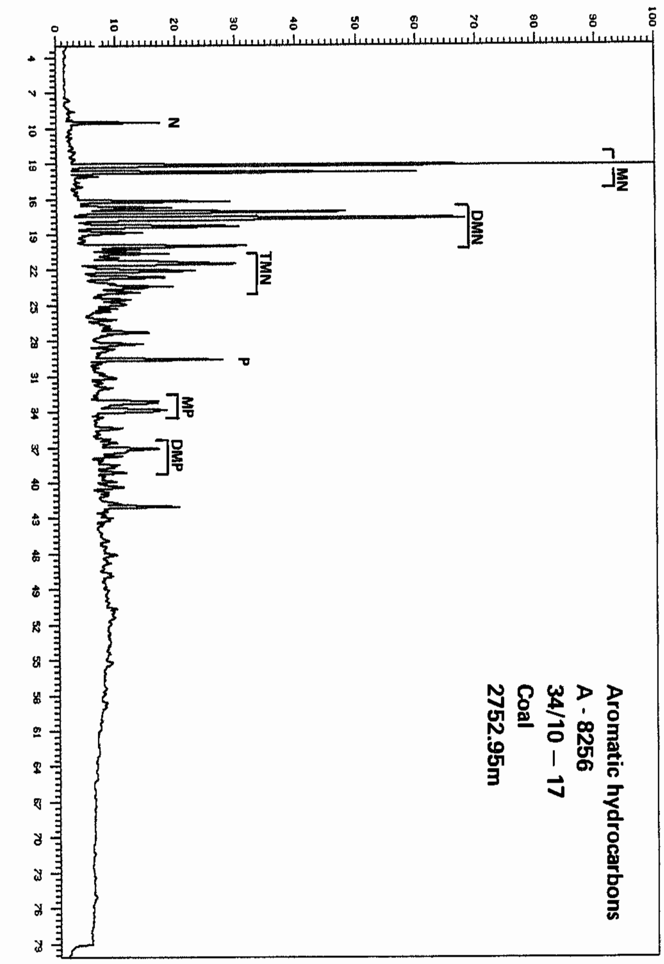
Analysis :50180A8260A1 Sample #: 1 Injection #: 1
Sample Name .A-8260,A,TV Maximum signal (%). 46.09

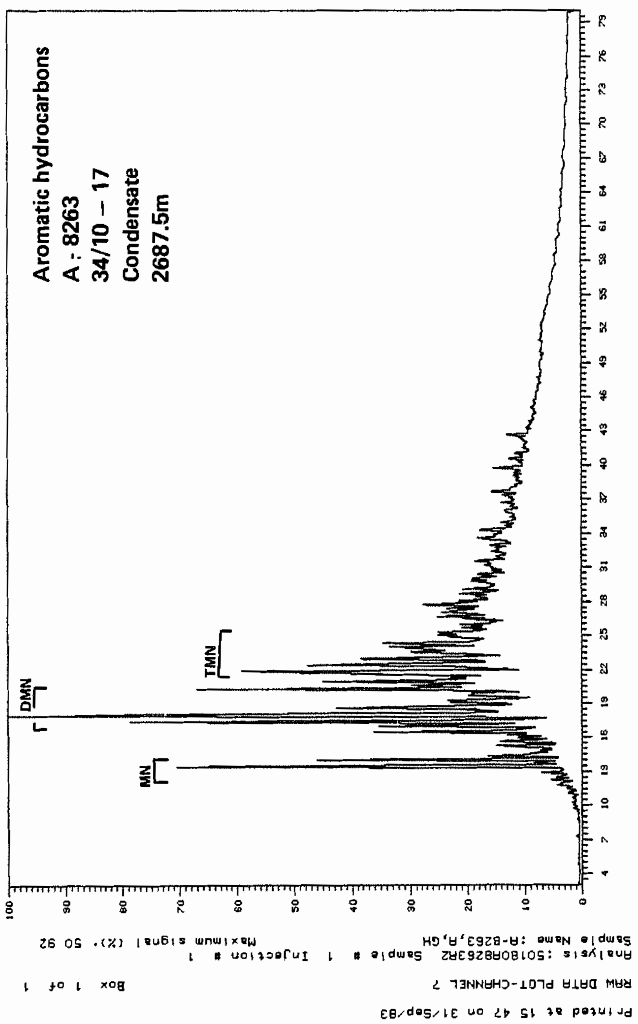


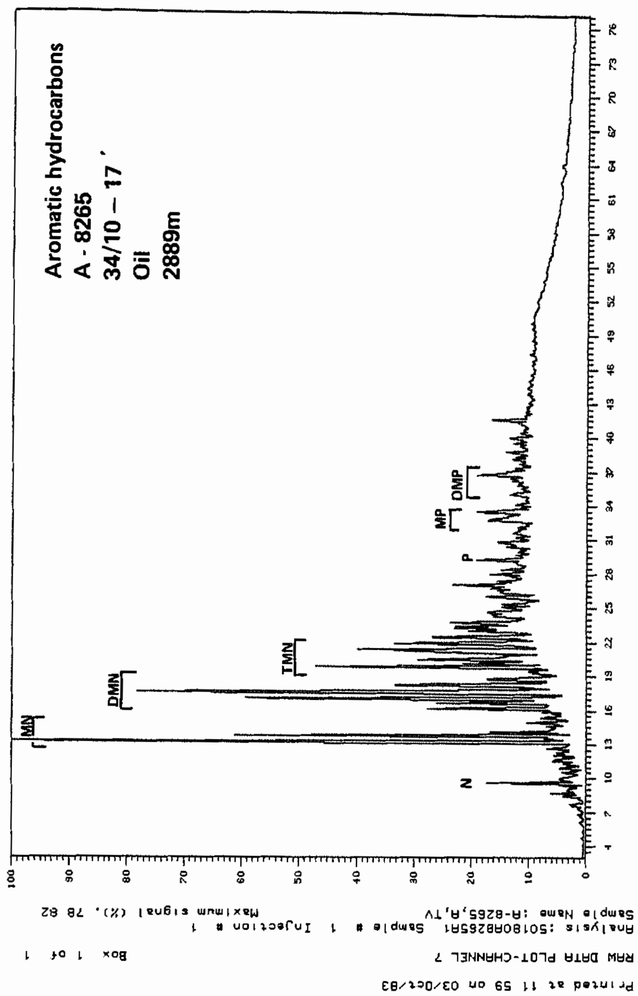
rinted at 15:22 on 29/Sep/83

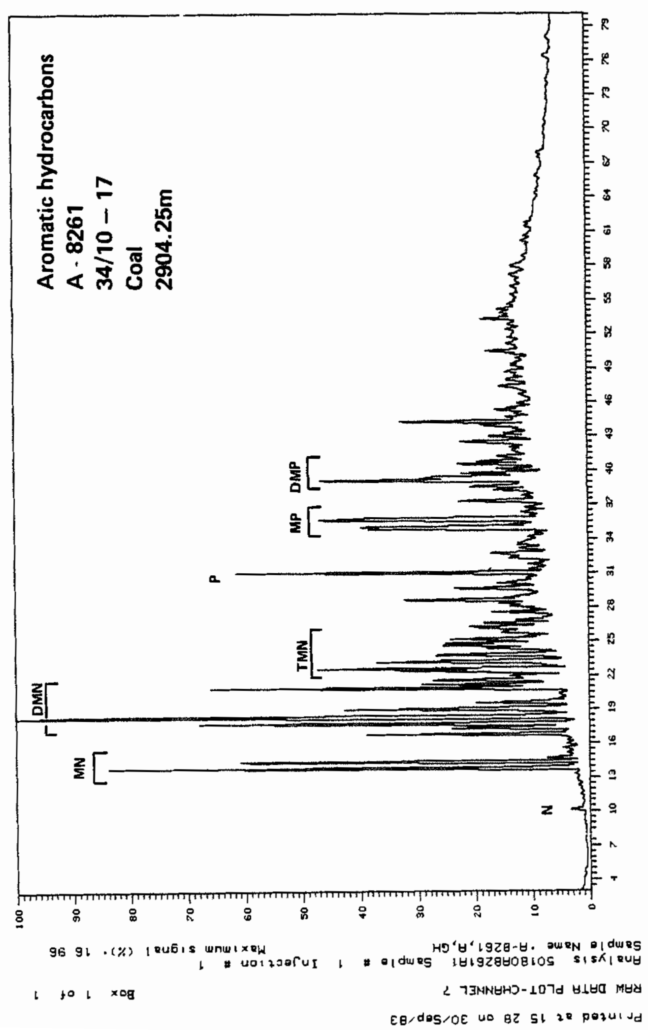
RAW DATA PLOT-CHANNEL 7 Box 1 of 1

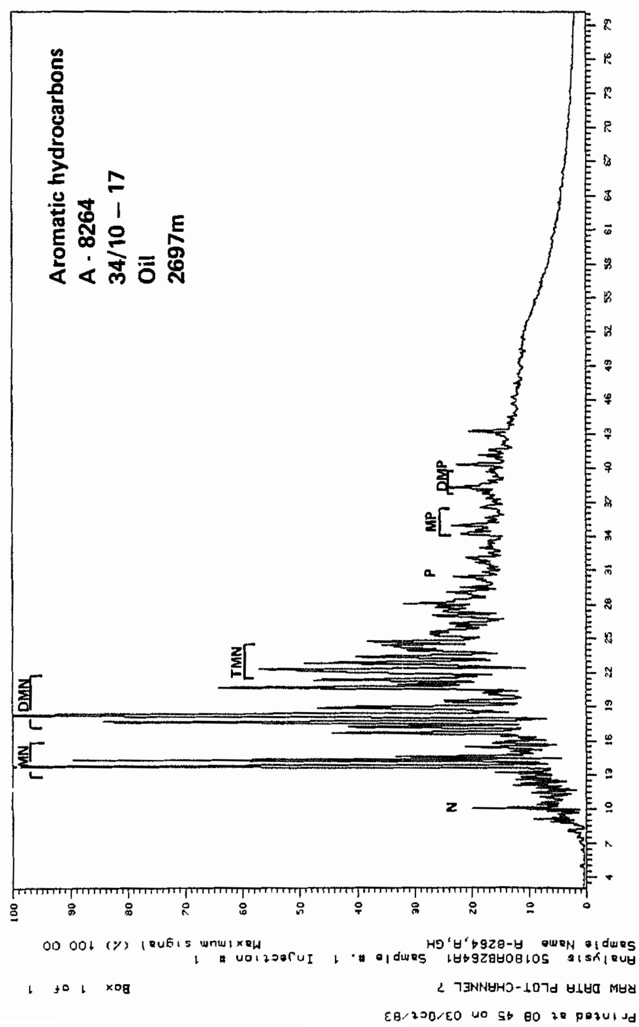
Analysis :50180A8256A1 Sample #: 1 Injection #: 1
Sample Name :A-8256,A,TV Maximum signal (%): 17.97




Aromatic hydrocarbons
A : 8263
34/10 – 17
Condensate
2687.5m
MN
DMN
TMN
Printed at 15 47 on 31/Sep/83
RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :5018ORB263R2 Sample # 1 Injection # 1
Sample Name :A-8263,A,GH
Maximum signal (%): 50 92


Aromatic hydrocarbons
A - 8265
34/10 – 17
Oil
2889m
N
MN
DMN
TMN
P
MP
DMP
Printed at 11 59 on 03/Oct/83
RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis :5018ORB265R1 Sample # 1 Injection # 1
Sample Name :A-8265,A,TV
Maximum signal (%): 78 82


Aromatic hydrocarbons
A - 8261
34/10 – 17
Coal
2904.25m
N
MN
DMN
TMN
P
MP
DMP
Printed at 15 28 on 30/Sep/83
RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis 5018ORB261R1 Sample # 1 Injection # 1
Sample Name :A-8261,A,GH
Maximum signal (%): 16 96


Aromatic hydrocarbons
A - 8264
34/10 – 17
Oil
2697m
N
MN
DMN
TMN
P
MP
DMP
Printed at 08 45 on 03/Oct/83
RAW DATA PLOT-CHANNEL 7
Box 1 of 1
Analysis 5018ORB264R1 Sample #. 1 Injection # 1
Sample Name A-8264,A,GH
Maximum signal (%) 100 00

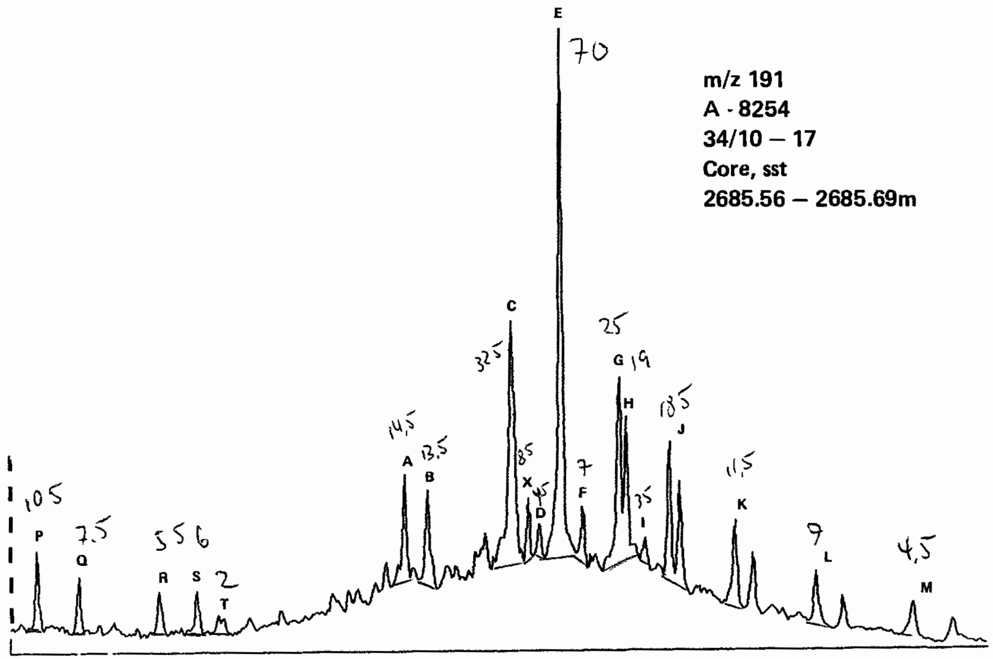
IKU

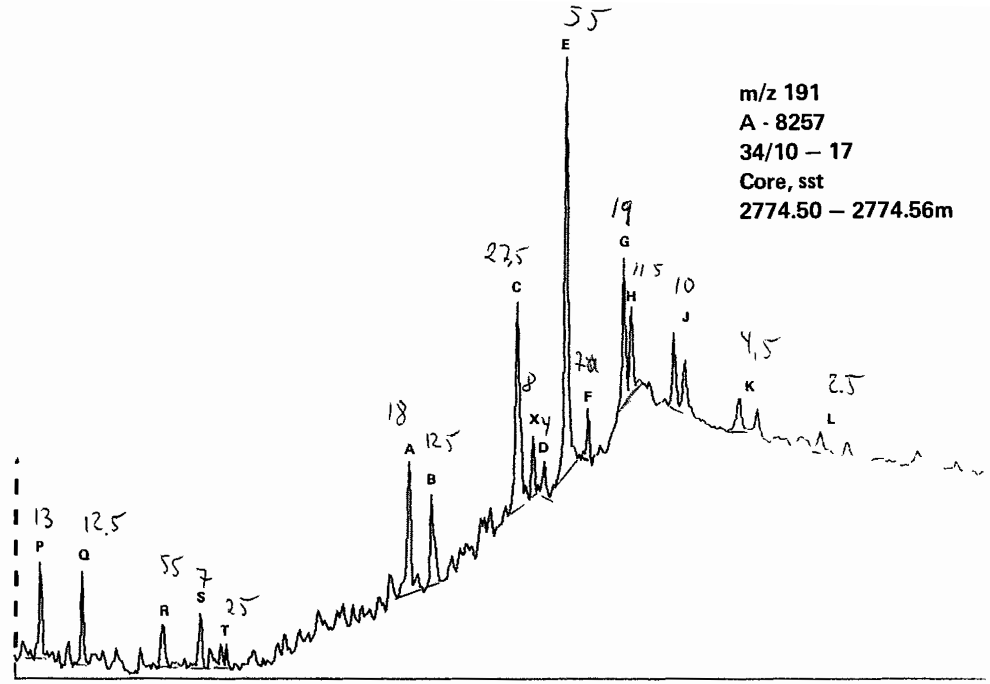
Well 34/10-17

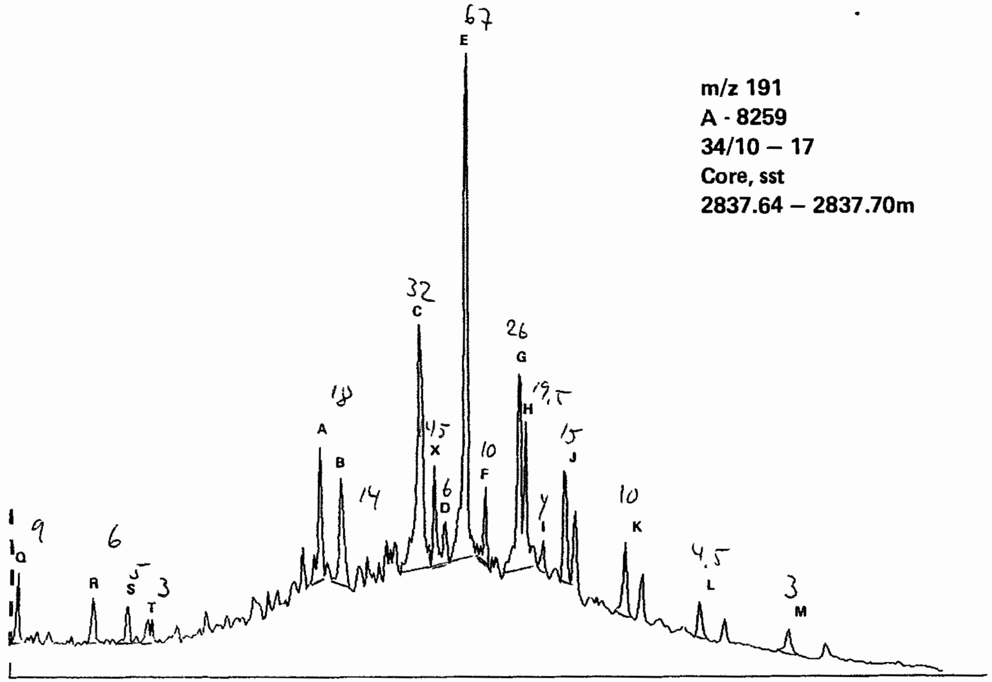
Figure 4.

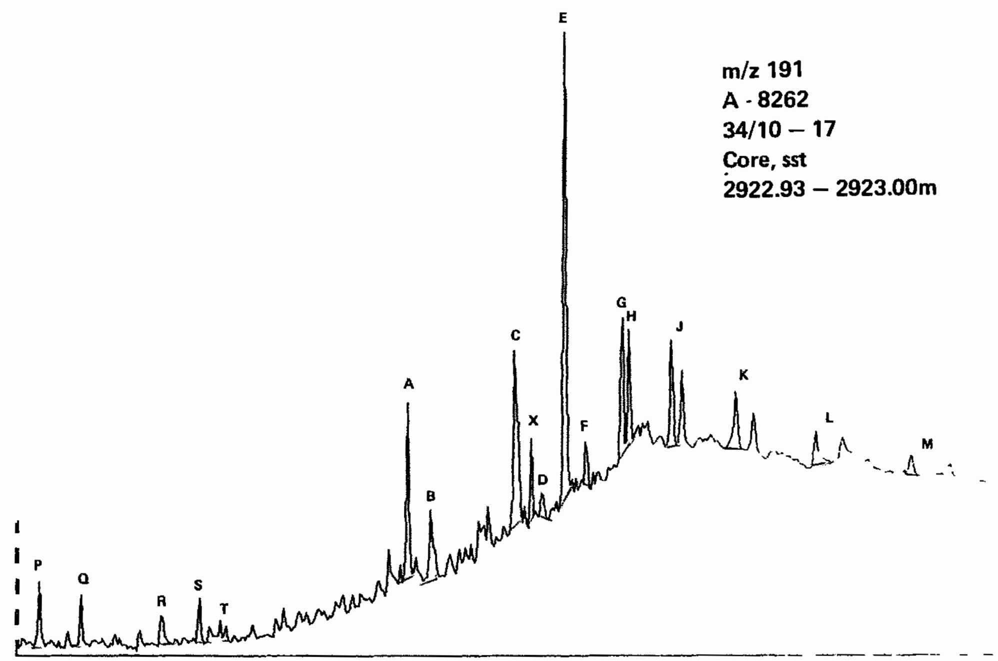
Mass chromatograms representing terpanes (m/z 191)

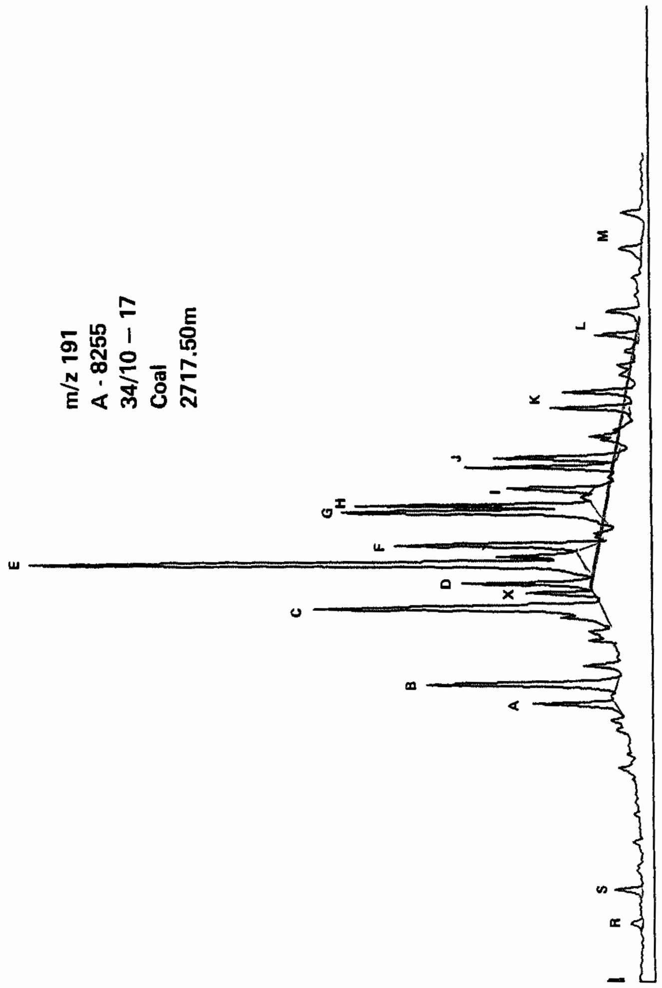
A	T_s, 18α(H)-trisnorneohopane	$C_{27}H_{46}$	(III)
B	T_m, 17α(H)-trisnorhopane	$C_{27}H_{46}$	(I,R=H)
C	17α(H)-norhopane	$C_{29}H_{50}$	(I,R=C_2H_5)
D	17β(H)-normoretane	$C_{29}H_{50}$	(II,R=C_2H_5)
E	17α(H)-hopane	$C_{30}H_{52}$	(I,R=C_3H_7)
F	17β(H)-moretane	$C_{30}H_{52}$	(II,R=C_3H_7)
G	17α(H)-homohopane (22S)	$C_{31}H_{54}$	(I,R=C_4H_9)
H	17α(H)-homohopane (22R)	$C_{31}H_{54}$	(I,R=C_4H_9)
	+ unknown triterpane (gammacerane?)		
I	17β(H)-homomoretane	$C_{31}H_{54}$	(II,R=C_4H_9)
J	17α(H)-bishomohopane (22S,22R)	$C_{32}H_{56}$	(I,R=C_5H_{11})
K	17α(H)-trishomohopane (22S,22R)	$C_{33}H_{58}$	(I,R=C_6H_{13})
L	17α(H)-tetrakishomohopane (22S,22R)	$C_{34}H_{60}$	(I,R,=C_7H_{15})
M	17α(H)-pentakishomohopane (22S,22R)	$C_{35}H_{62}$	(I,R=C_8H_{17})
Z	bisnorhopane	$C_{28}H_{48}$	
X	unknown triterpane	$C_{30}H_{52}$	
P	tricyclic terpane	$C_{23}H_{42}$	(IV,R=C_4H_9)
Q	tricyclic terpane	$C_{24}H_{44}$	(IV,R=C_5H_{11})
R	tricyclic terpane (17R,17S)	$C_{25}H_{46}$	(IV,R=C_6H_{13})
S	tetracyclic terpane	$C_{24}H_{42}$	(V)
T	tricyclic terpane (17R,17S)	$C_{26}H_{48}$	(IV,R=C_7H_{15})

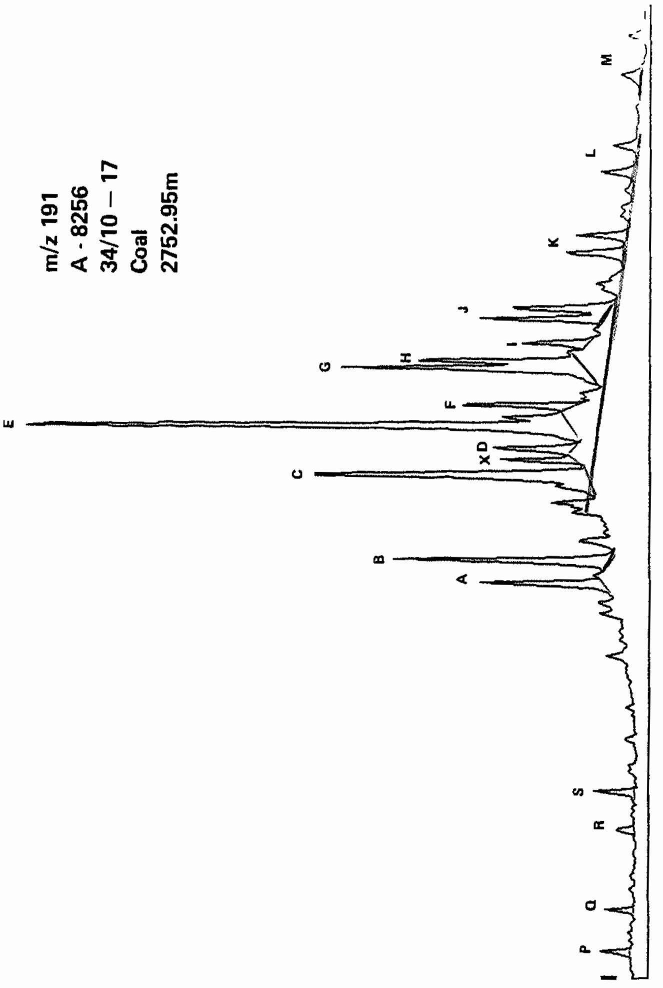

m/z 191
A - 8254
34/10 – 17
Core, sst
2685.56 – 2685.69m

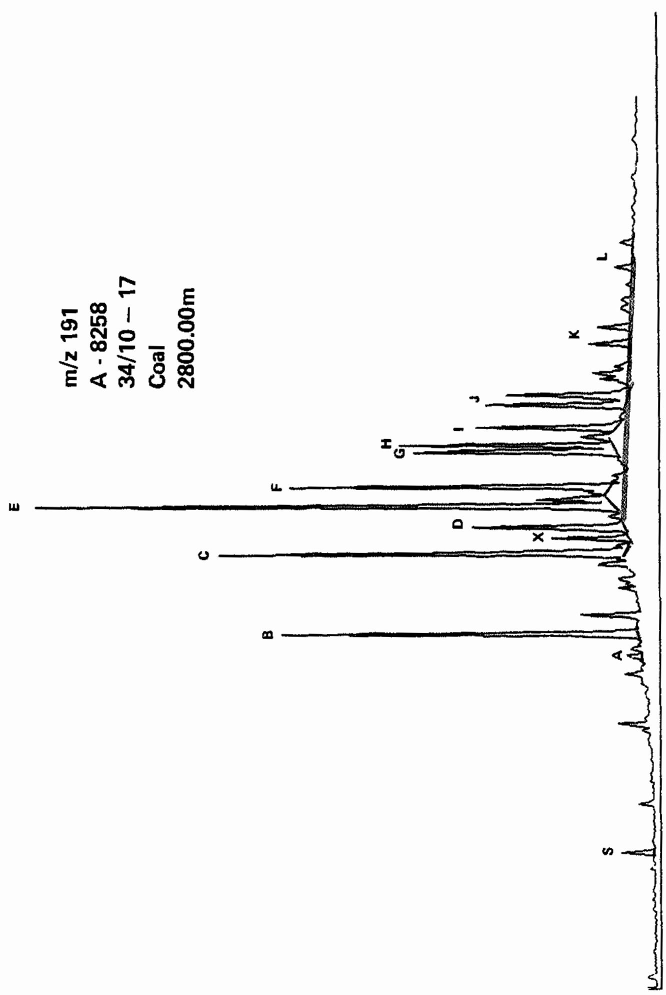

m/z 191
A - 8257
34/10 – 17
Core, sst
2774.50 – 2774.56m

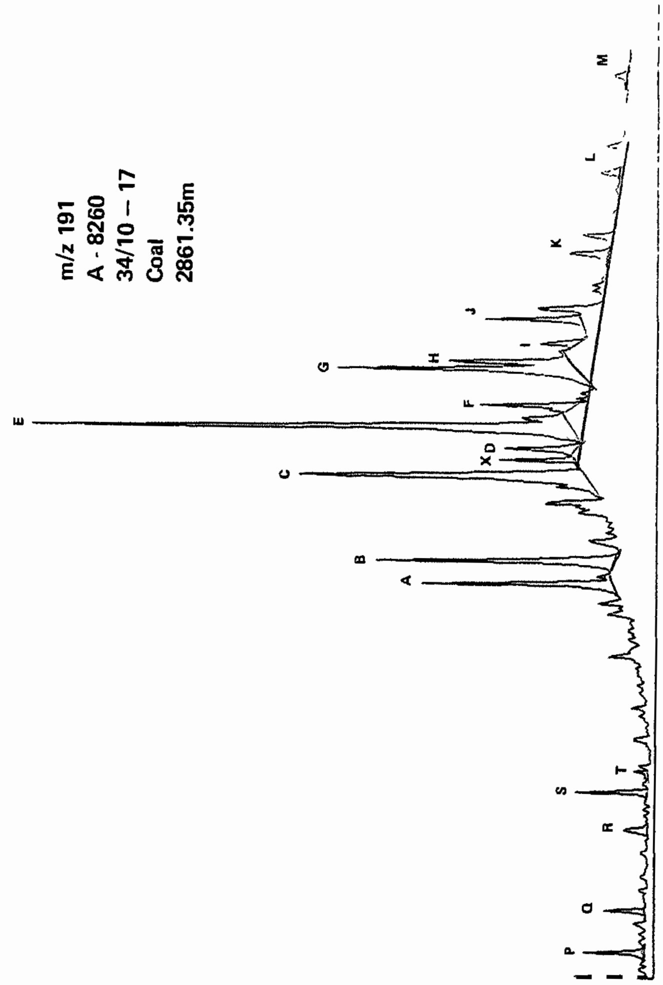

m/z 191
A - 8259
34/10 – 17
Core, sst
2837.64 – 2837.70m

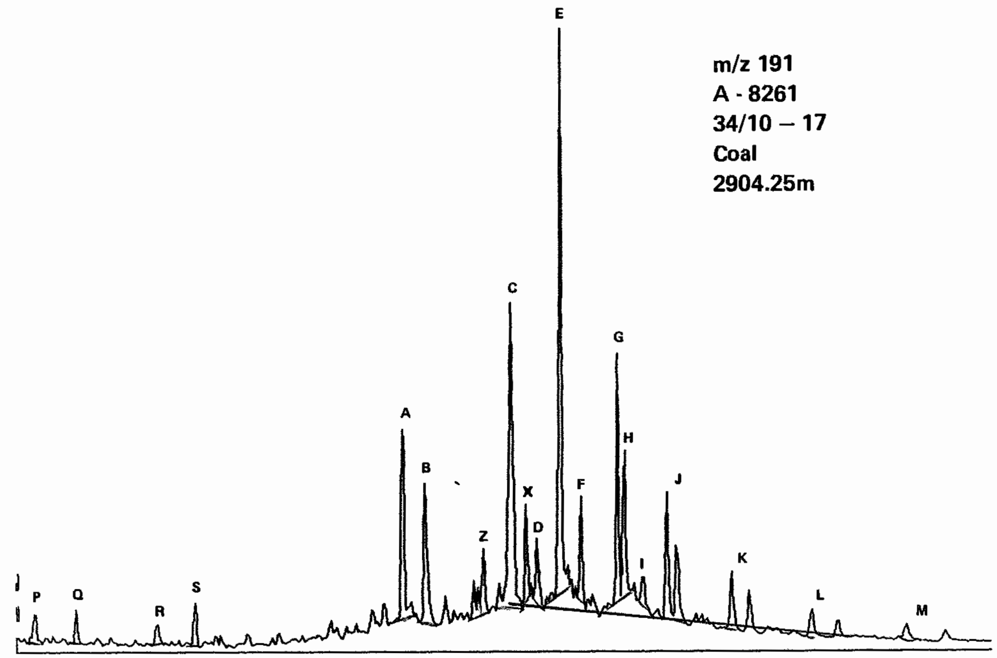

m/z 191
A - 8262
34/10 – 17
Core, sst
2922.93 – 2923.00m

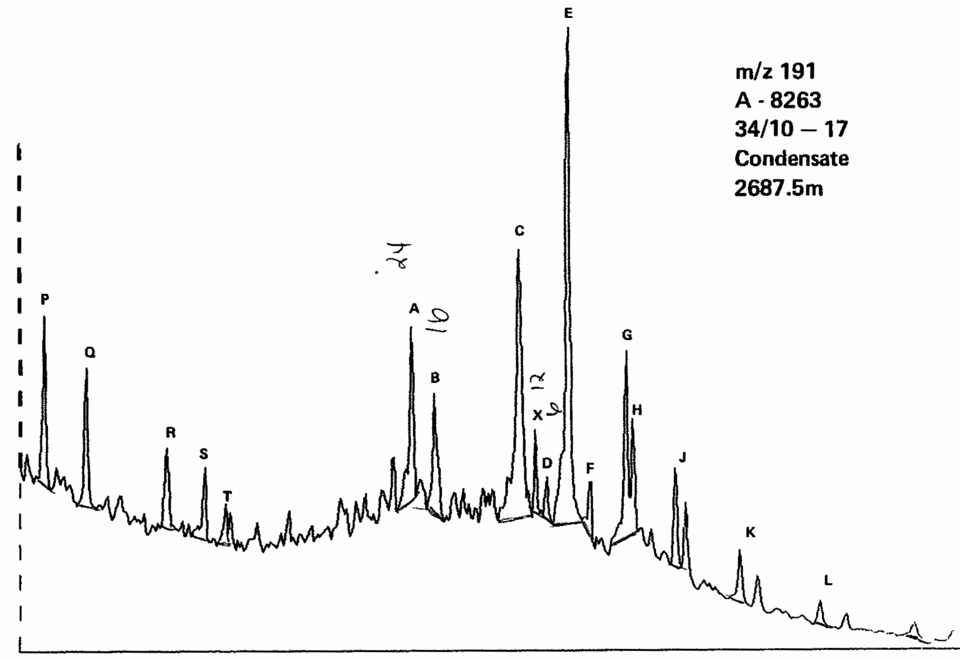

m/z 191
A - 8255
34/10 – 17
Coal
2717.50m

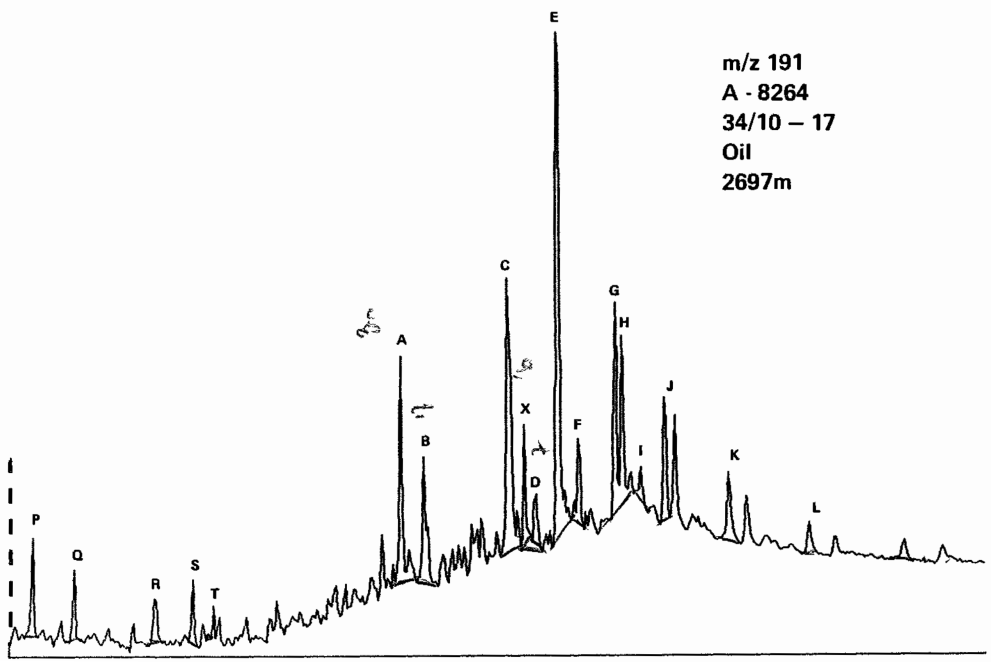

m/z 191
A - 8256
34/10 – 17
Coal
2752.95m

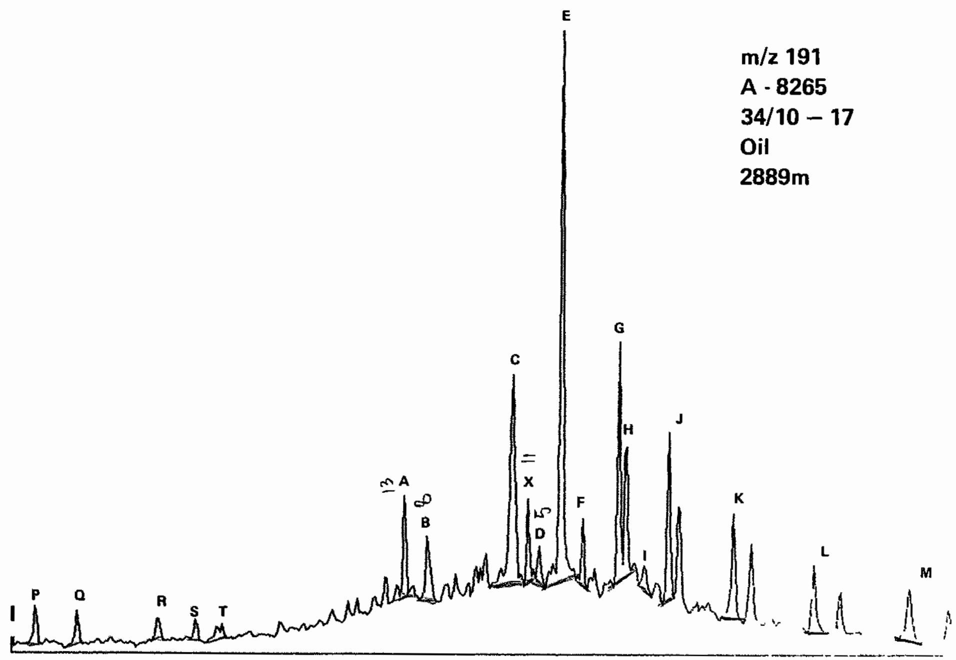

m/z 191
A - 8258
34/10 – 17
Coal
2800.00m


m/z 191
A - 8260
34/10 – 17
Coal
2861.35m


m/z 191
A - 8261
34/10 — 17
Coal
2904.25m
P Q R S A B Z C X D E F G H I J K L M


m/z 191
A - 8263
34/10 — 17
Condensate
2687.5m
P Q R S T A B C X D E F G H J K L


m/z 191
A - 8264
34/10 — 17
Oil
2697m
P Q R S T A B C X D E F G H I J K L

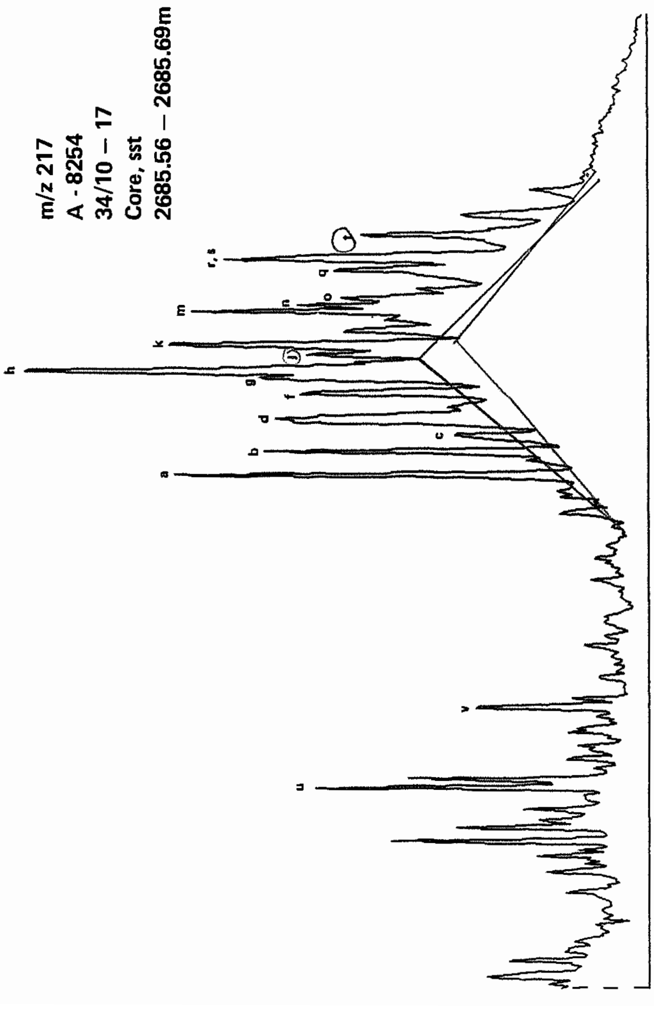

m/z 191
A - 8265
34/10 — 17
Oil
2889m
P Q R S T A B C X D E F G H I J K L M

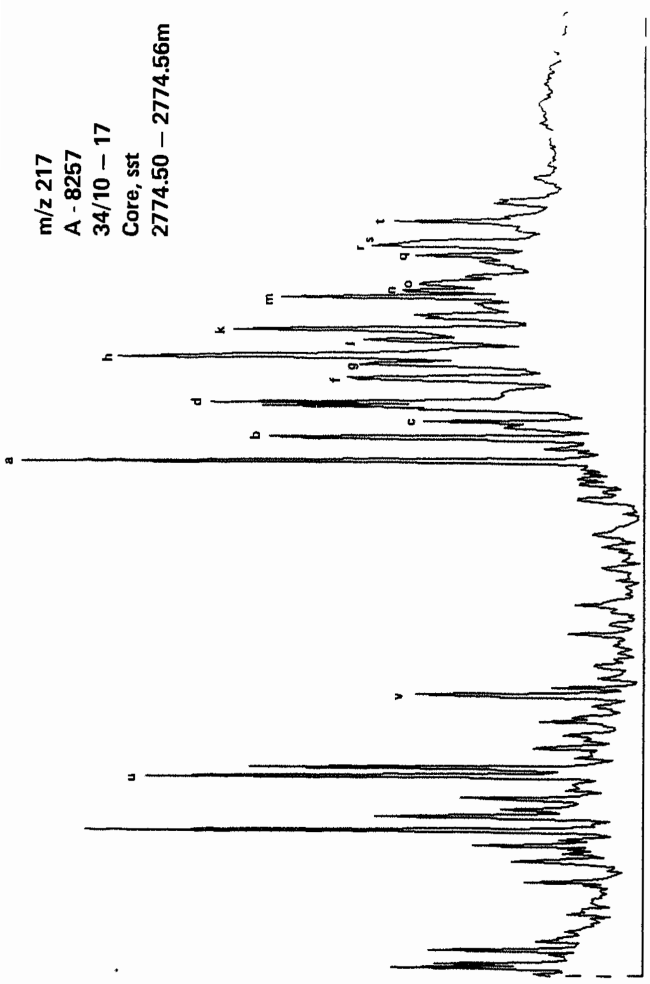
Well 34/10-17

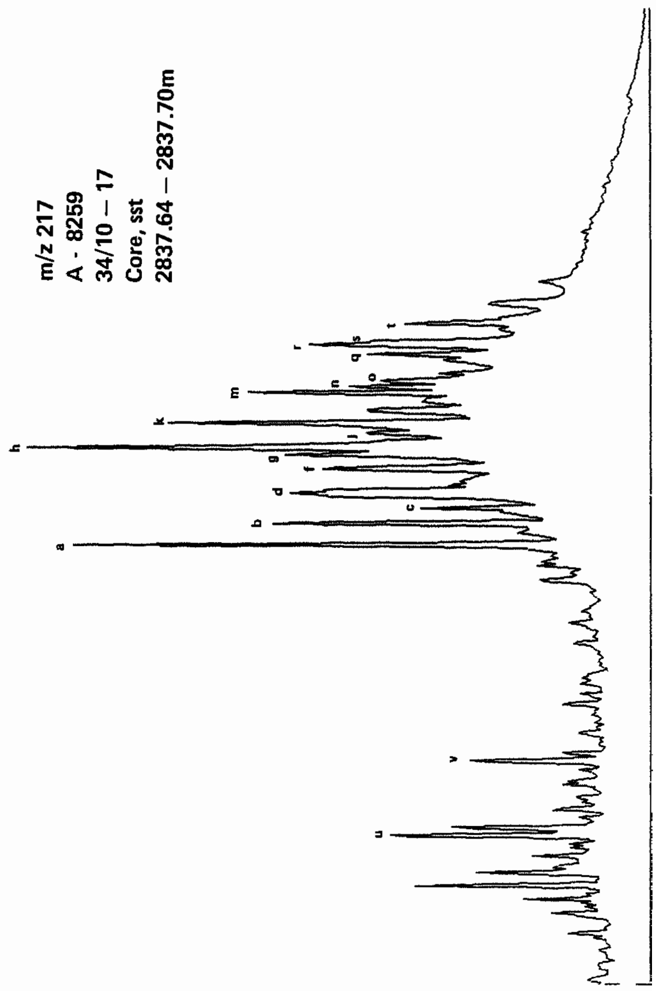
Figure 5.

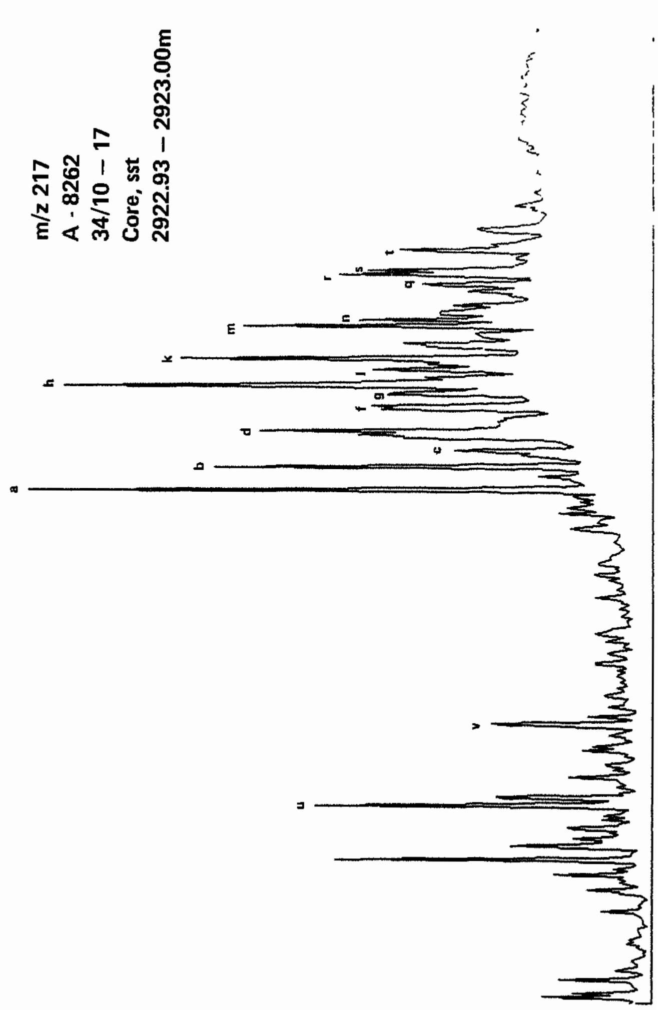
Mass chromatograms representing steranes (m/z 217 and 218)

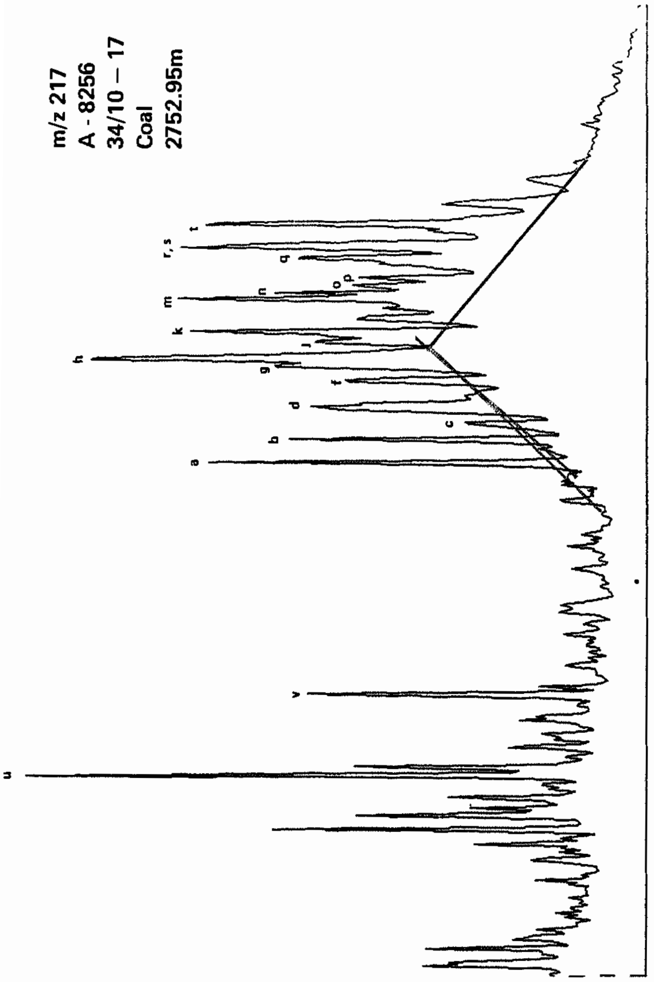
a	13β(H),17α(H)-diasterane (20S)	$C_{27}H_{48}$	(III,R=H)
b	13β(H),17α(H)-diasterane (20R)	$C_{27}H_{48}$	(III,R=H)
c	13α(H),17β(H)-diasterane (20S)	$C_{27}H_{48}$	(IV,R=H)
d	13α(H),17β(H)-diasterane (20R)	$C_{27}H_{48}$	(IV,R=H)
e	13β(H),17α(H)-diasterane (20S)	$C_{28}H_{50}$	(III,R=CH_3)
f	13β(H),17α(H)-diasterane (20R)	$C_{28}H_{50}$	(III,R=CH_3)
g	13α(H),17β(H)-diasterane (20S)	$C_{28}H_{50}$	(IV,R=CH_3)
	+ 14α(H),17α(H)-sterane (20S)	$C_{27}H_{48}$	(I,R=H)
h	13β(H),17α(H)-diasterane (20S)	$C_{29}H_{52}$	(III,R=C_2H_5)
	+ 14α(H),17α(H)-sterane (20R)	$C_{27}H_{48}$	(II,R=H)
i	14β(H),17β(H)-sterane (20S)	$C_{27}H_{48}$	(II,R=H)
	+ 13α(H),17β(H)-diasterane (20R)	$C_{28}H_{50}$	(IV,R=CH_3)
j	14α(H),17α(H)-sterane (20R)	$C_{27}H_{48}$	(I,R=H)
k	13β(H),17α(H)-diasterane (20R)	$C_{29}H_{52}$	(III,R=C_2H_5)
l	13α(H),17β(H)-diasterane (20S)	$C_{29}H_{52}$	(III,R=C_2H_5)
m	14α(H),17α(H)-sterane (20S)	$C_{28}H_{50}$	(I,R=CH_3)
n	13α(H),17β(H)-diasterane (20R)	$C_{29}H_{52}$	(III,R=C_2H_5)
	+ 14β (H),17β (H)-steane (20R)	$C_{28}H_{50}$	(II,R=CH_3)
o	14β(H),17β(H)-sterane (20S)	$C_{28}H_{50}$	(II,R=CH_3)
p	14α(H),17α(H)-steane (20R)	$C_{28}H_{50}$	(I,R=CH_3)
q	14α(H),17α(H)-sterane (20S)	$C_{29}H_{52}$	(I,R=C_2H_5)
r	14β(H),17β(H)-sterane (20R)	$C_{29}H_{52}$	(II,R=C_2H_5)
	+ unknown sterane		
s	14β(H),17β(H)-sterane (20S)	$C_{29}H_{52}$	(II,R=C_2H_5)
t	14α(H),17β(H)-sterane (20R)	$C_{29}H_{52}$	(I,R=C_2H_5)
u	5α(H)-sterane	$C_{21}H_{36}$	(V,R=C_2H_5)
v	5α(H)-sterane	$C_{22}H_{38}$	(IV,R=C_3H_7)

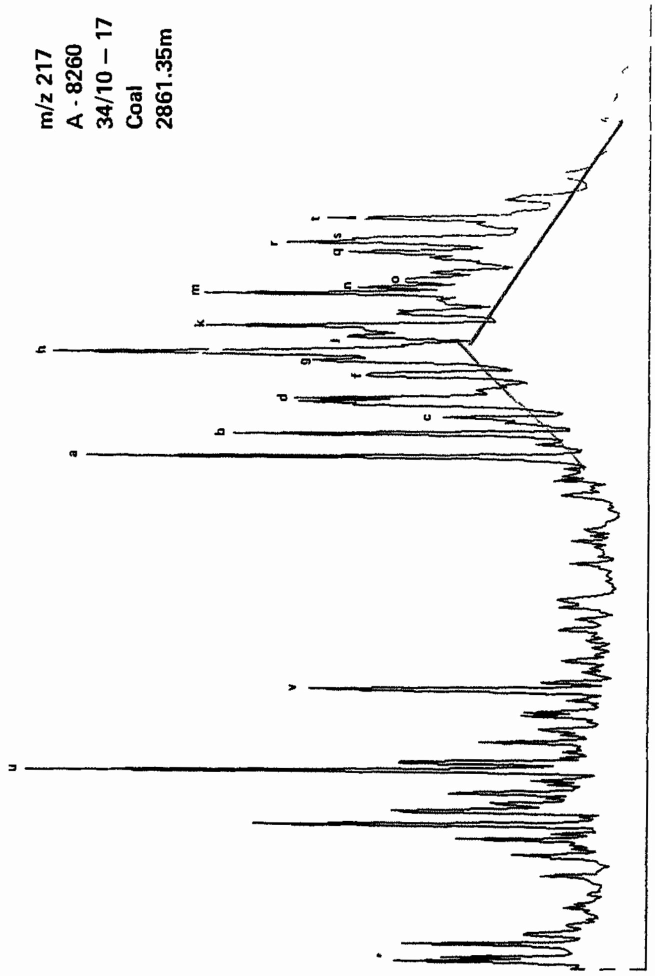

m/z 217
A - 8254
34/10 — 17
Core, sst
2685.56 — 2685.69m


m/z 217
A - 8257
34/10 — 17
Core, sst
2774.50 — 2774.56m


m/z 217
A - 8259
34/10 — 17
Core, sst
2837.64 — 2837.70m


m/z 217
A - 8262
34/10 — 17
Core, sst
2922.93 — 2923.00m


m/z 217
A - 8256
34/10 – 17
Coal
2752.95m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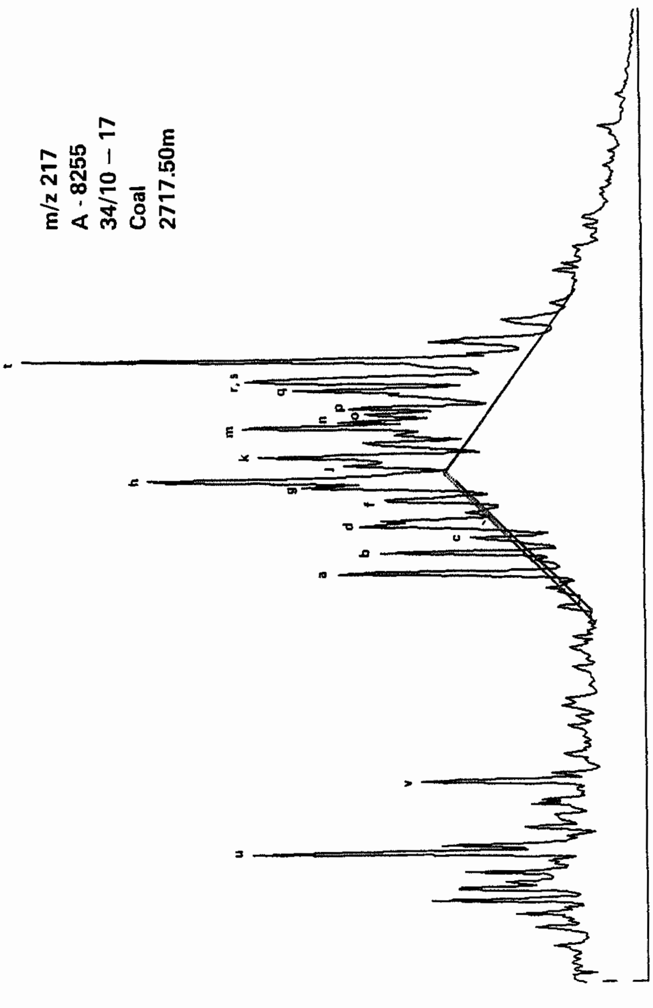
A - 8260
34/10 – 17
Coal
2861.35m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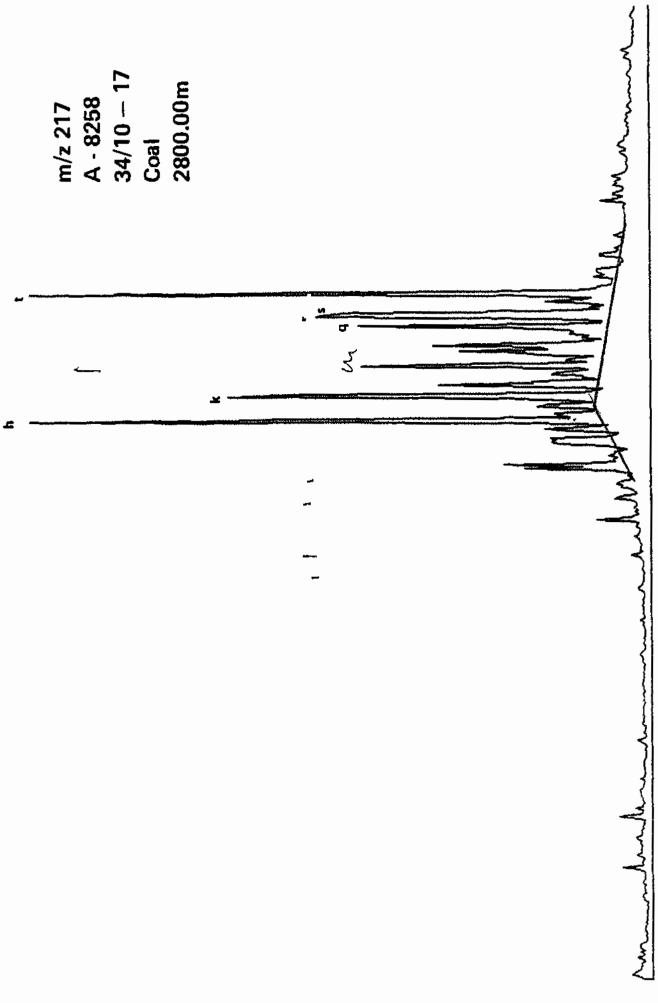
A - 8255
34/10 – 17
Coal
2717.50m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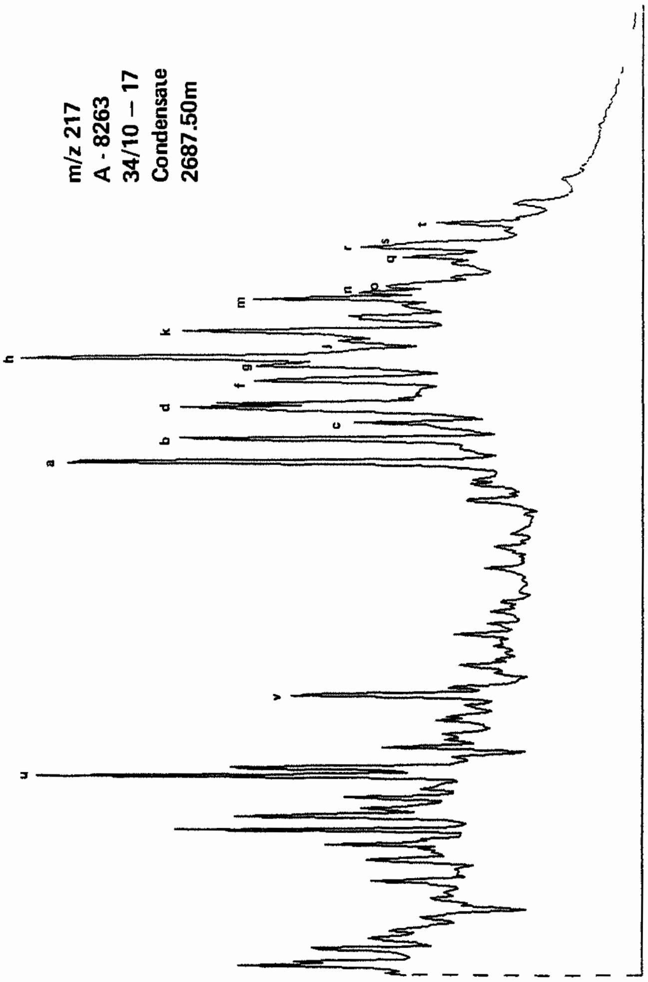
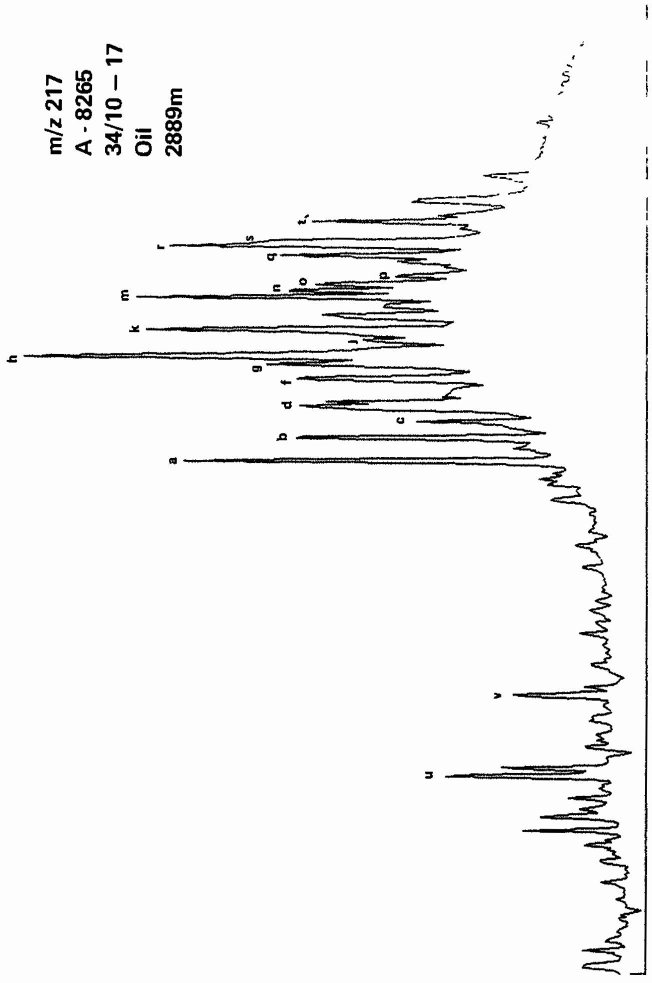
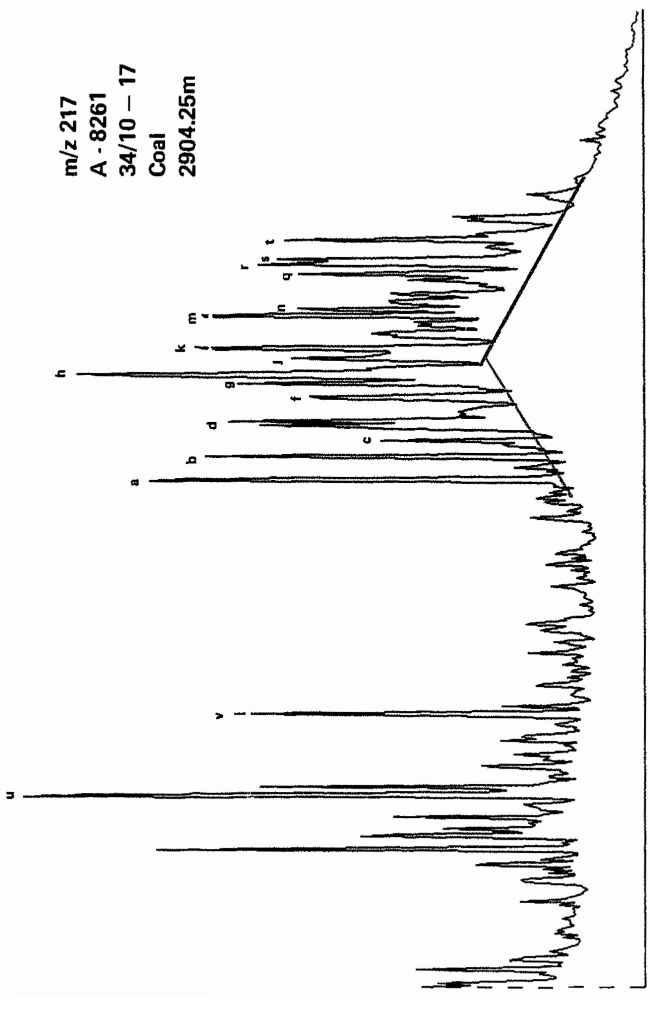
A - 8258
34/10 – 17
Coal
2800.00m


m/z 217
A - 8263
34/10 – 17
Condensate
2687.50m


m/z 217
A - 8265
34/10 – 17
Oil
2889m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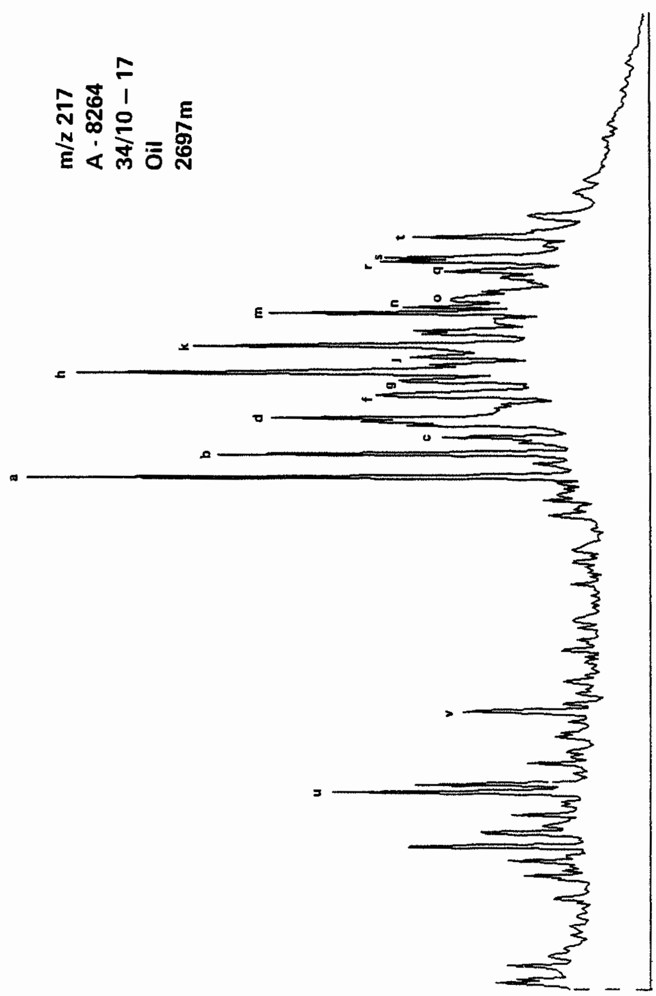
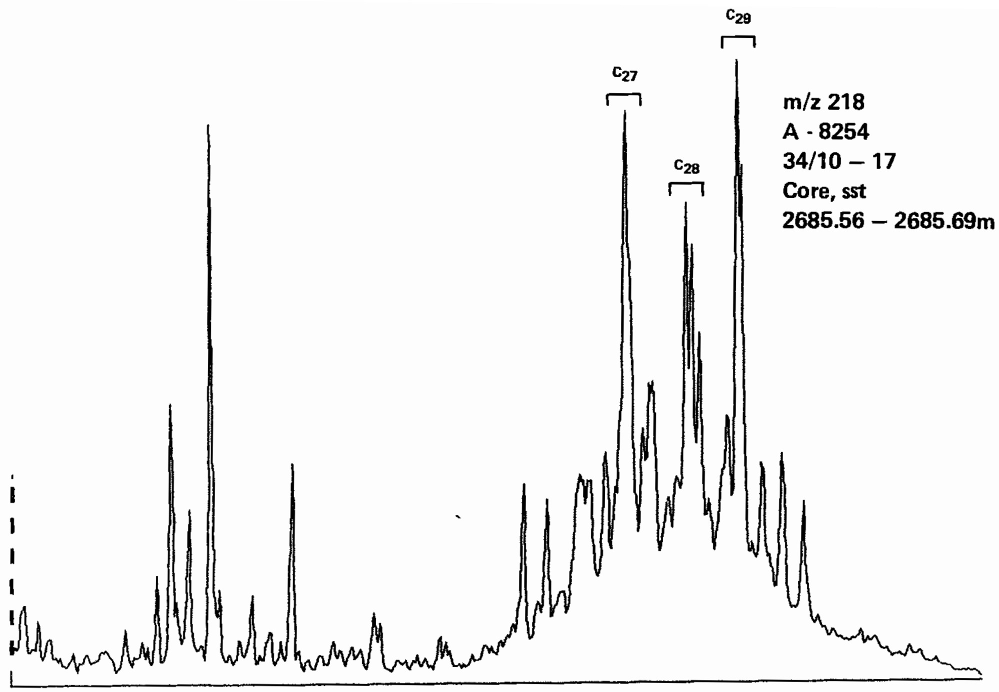
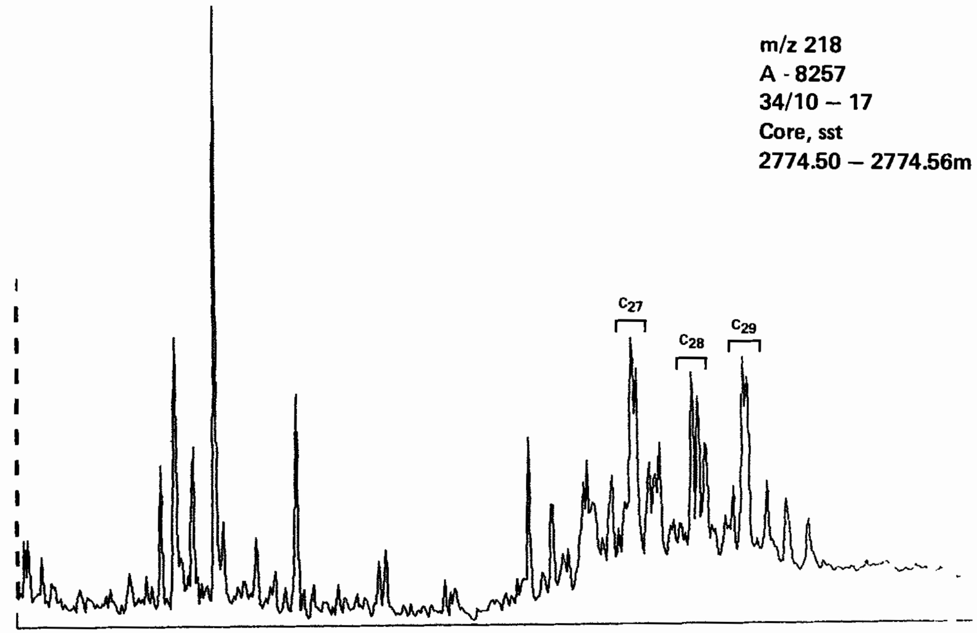
A - 8261
34/10 – 17
Coal
2904.25m

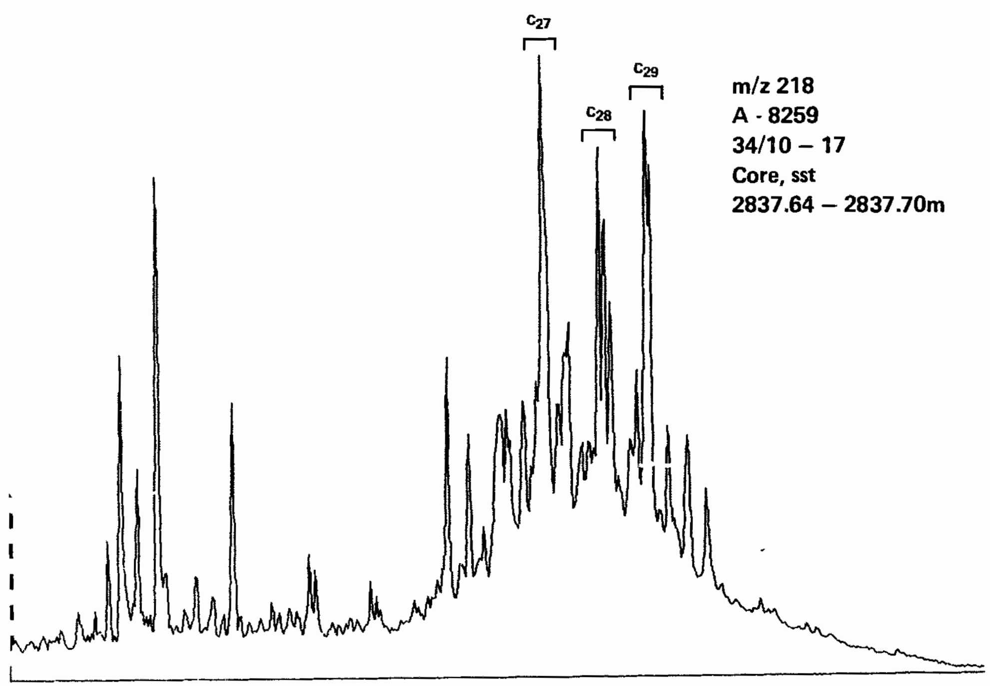

m/z 217
A - 8264
34/10 – 17
Oil
2697m



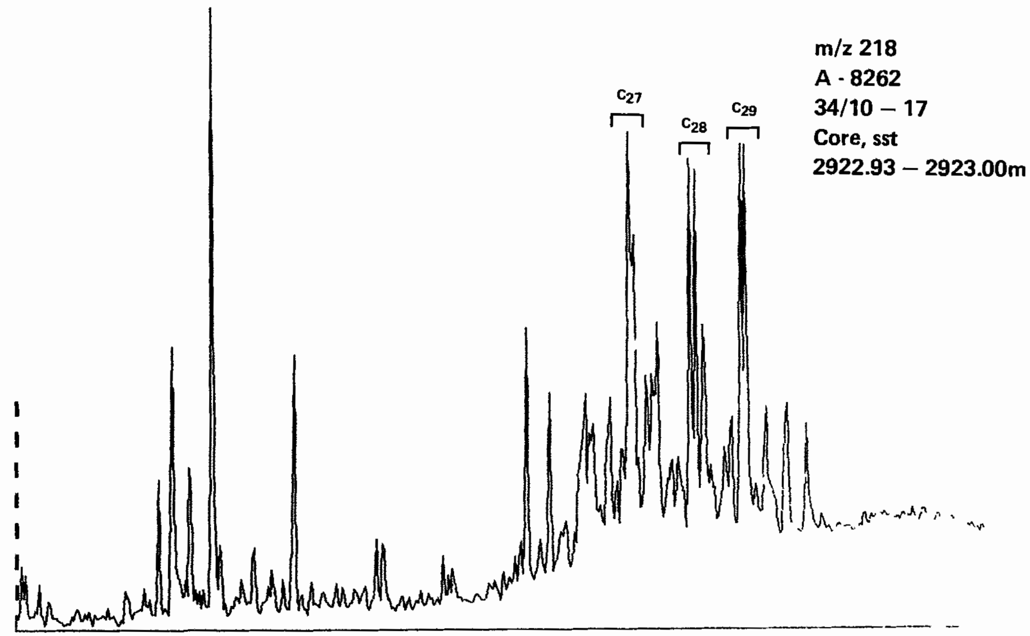
C_{27}
C_{28}
C_{29}
m/z 218
A - 8254
34/10 – 17
Core, sst
2685.56 – 2685.69m



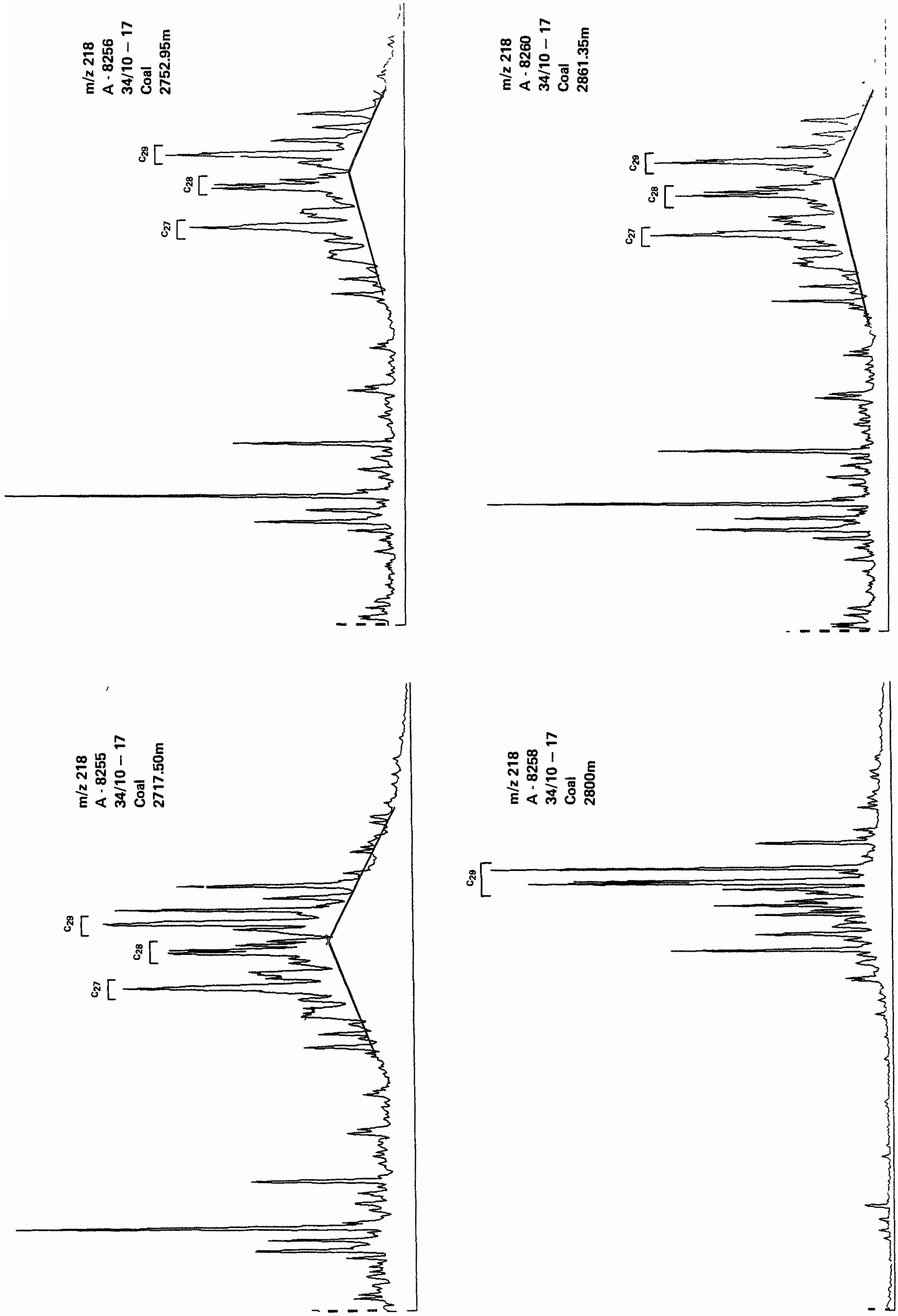
m/z 218
A - 8257
34/10 – 17
Core, sst
2774.50 – 2774.56m
C_{27}
C_{28}
C_{29}

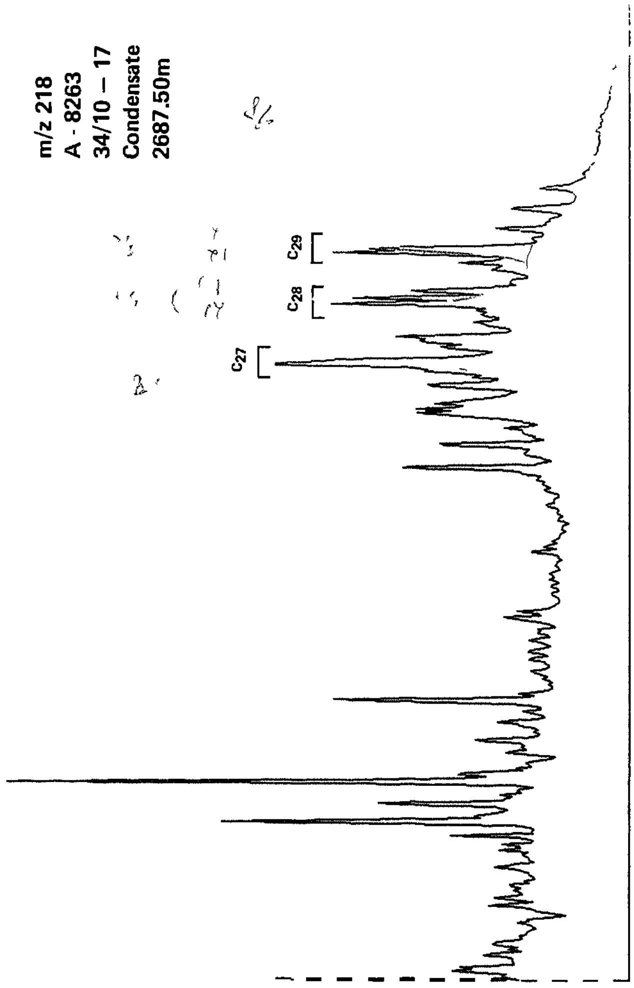


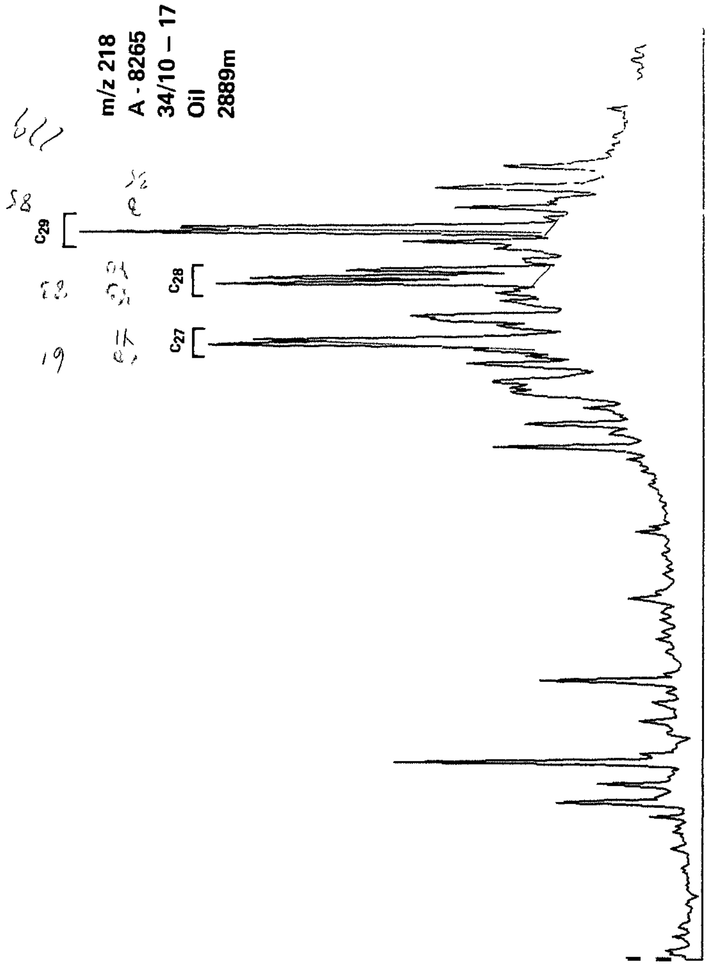
C_{27}
C_{28}
C_{29}
m/z 218
A - 8259
34/10 – 17
Core, sst
2837.64 – 2837.70m

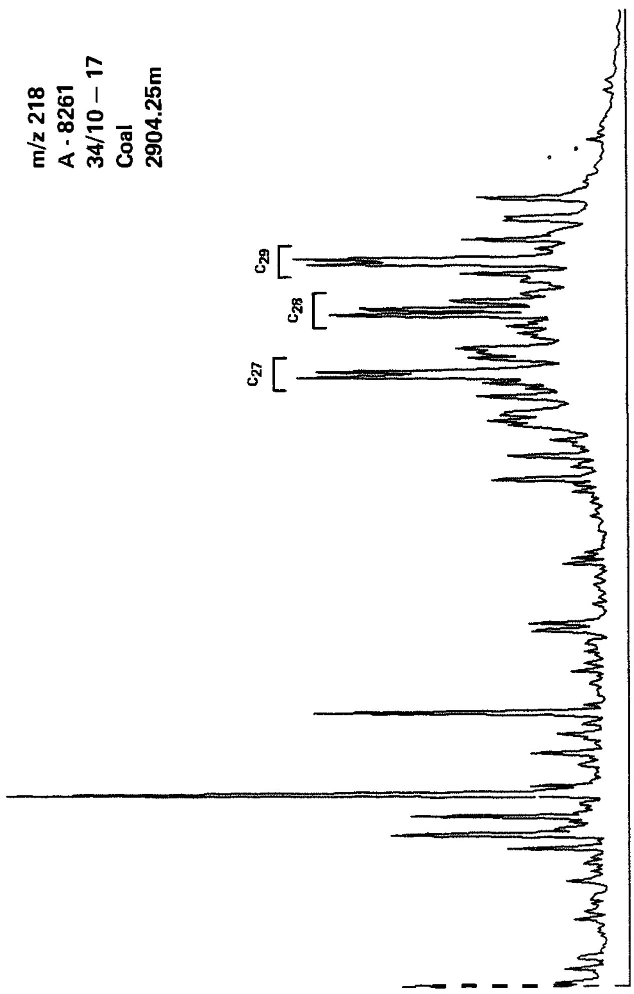


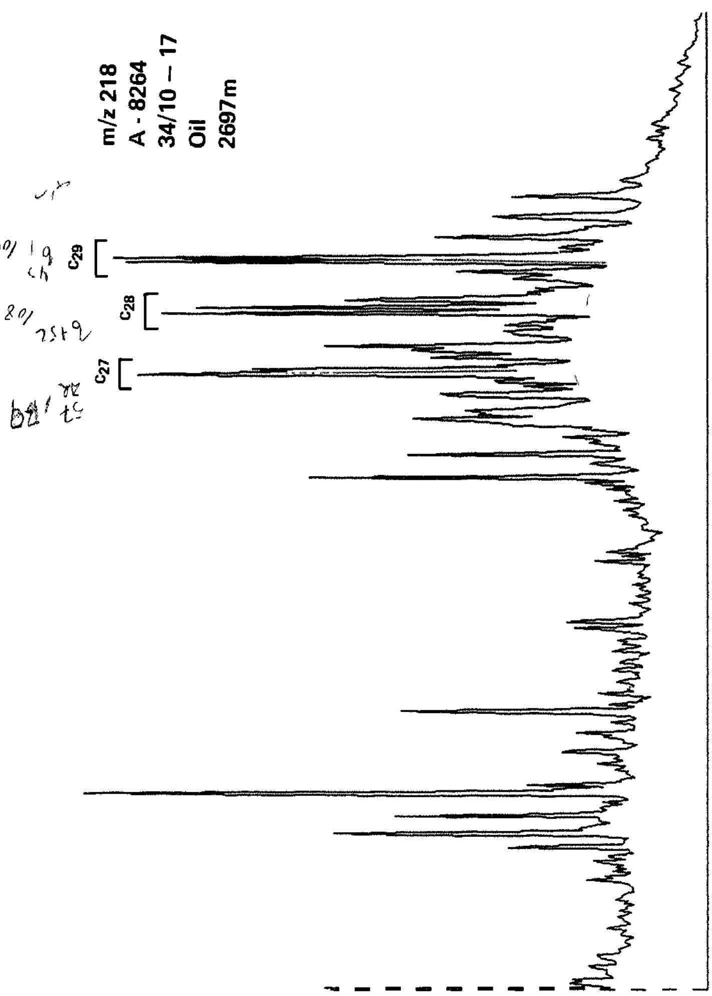
m/z 218
A - 8262
34/10 – 17
Core, sst
2922.93 – 2923.00m
C_{27}
C_{28}
C_{29}


m/z 218
A - 8256
34/10 – 17
Coal
2752.95m
C_{29}
C_{28}
C_{27}
m/z 218
A - 8260
34/10 – 17
Coal
2861.35m
C_{29}
C_{28}
C_{27}
m/z 218
A - 8255
34/10 – 17
Coal
2717.50m
C_{29}
C_{28}
C_{27}
m/z 218
A - 8258
34/10 – 17
Coal
2800m
C_{29}


m/z 218
A - 8263
34/10 – 17
Condensate
2687.50m
C_{29}
C_{28}
C_{27}


m/z 218
A - 8265
34/10 – 17
Oil
2889m
C_{29}
C_{28}
C_{27}


m/z 218
A - 8261
34/10 – 17
Coal
2904.25m
C_{29}
C_{28}
C_{27}


m/z 218
A - 8264
34/10 – 17
Oil
2697m
C_{29}
C_{28}
C_{27}