

Prepared for

FINA EXPLORATION NORWAY INC

**ANALYTICAL DATA FOR CRUDE OILS,
NORWEGIAN CONTINENTAL SHELF**

JULY 1993

Geochem Group Limited

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GENERAL COMMENT

Only limited amounts of sample material were available for this study. In consequence some analyses had to be omitted. Distillations were difficult with only 3g of crude oil.

It was not possible to perform the following analyses

- a) %S: HA 584
- b) % N₂: HA 584
- c) Ni, V:
- d) Distillation:
- e) Carbon isotopes:

Front end loss was evident in some of the saturates fractions obtained by distillation. Accordingly, fresh saturates fractions were prepared without distillation for the following samples: HA 584.

TABLE 1
CRUDE OIL COMPOSITION - PHYSICAL

JOB 8237						
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	SPECIFIC GRAVITY (g/cc)	API GRAVITY	VISCOSITY (cp)	POUR POINT (°C)	DISTILLAT TO 210°C (%)

8237-019 HA 584

56.00

TABLE 2
CRUDE OIL COMPOSITION - CHEMICAL

JOB 8237							
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	WAX CONTENT (%)	WAX MELTING POINT (°C)	SULPHUR (%)	NITROGEN (%)	V (ppm)	Ni (ppm)
8237-019	HA 584	3	31			<0.1	<0.1

TABLE 3
COMPOSITION (NORMALISED %) OF C₁₅₊ MATERIAL

JOB 8237 GEOCHEM SAMPLE NUMBER	L I T H O	DEPTH/ IDENTITY	HYDROCARBONS		NON HYDROCARBONS		
			Saturates	Aromatics	Preciptd. Asphaltenes	Eluted NSO's	Non-Eluted NSO's
8237-019		HA 584	54.39	27.90	1.20	15.46	1.05

TABLE 4
SIGNIFICANT C₁₅₊ RATIOS

JOB 8237	L I T H O	DEPTH/ IDENTITY	TOC (%)	mg/g TOC						HYDROCARBONS & TOTAL EXTRACT	SATURATES AROMATICS
				TOTAL EXTRACT	SATURATES	AROMATICS	TOTAL HYDROCARBONS	ELUTED NSO's	ASPHALTENES		

8237-019

HA 584

82.29

1.95

TABLE 5
COMPOSITION (NORMALISED %) OF C₁₅₊ SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	019
DEPTH	HA 584
SAMPLE TYPE	
nC15	10.02
nC16	9.66
nC17	9.09
nC18	8.04
nC19	7.86
nC20	7.52
nC21	6.50
nC22	5.96
nC23	5.63
nC24	5.09
nC25	4.12
nC26	3.97
nC27	3.43
nC28	2.86
nC29	2.62
nC30	2.23
nC31	2.08
nC32	1.66
nC33	0.99
nC34	0.45
nC35	0.23
Paraffin	24.75
Isoprenoid	5.12
Naphthene	70.13
CPI 1 Index	0.99
CPI 2 Index	1.00
CPI 3 Index	1.00
Prist/Phytane	1.21
Prist/nC17	0.69
Phytane/nC18	0.64

Job Number : 8237

$$C.P.I. 1 = \frac{1}{2} \left[\frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{20} + C_{22} + C_{24} + C_{26}} + \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{22} + C_{24} + C_{26} + C_{28}} \right]$$

$$C.P.I. 2 = \frac{1}{2} \left[\frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{24} + C_{26} + C_{28} + C_{30}} + \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{26} + C_{28} + C_{30} + C_{32}} \right]$$

$$P.I. 3 = \frac{2 \times (C_{27})}{C_{26} + C_{28}}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 6
COMPOSITION (PPM) OF C₁₅₊ SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	019
DEPTH	HA 584
SAMPLE TYPE	
nC15	24800
nC16	23909
nC17	22498
nC18	19899
nC19	19454
nC20	18612
nC21	16088
nC22	14751
nC23	13934
nC24	12598
nC25	10197
nC26	9826
nC27	8489
nC28	7079
nC29	6485
nC30	5519
nC31	5148
nC32	4109
nC33	2450
nC34	1114
nC35	569
Paraffin	247500
Isoprenoid	51200
Naphthene	701300
CPI 1 Index	0.99
CPI 2 Index	1.00
CPI 3 Index	1.00
Prist/Phytane	1.21
Prist/nC17	0.69
Phytane/nC18	0.64

Job Number : 8237

$$C.P.I. 1 = \frac{1}{2} \left[\frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{20} + C_{22} + C_{24} + C_{26}} + \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{22} + C_{24} + C_{26} + C_{28}} \right]$$

$$C.P.I. 2 = \frac{1}{2} \left[\frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{24} + C_{26} + C_{28} + C_{30}} + \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{26} + C_{28} + C_{30} + C_{32}} \right]$$

$$C.P.I. 3 = \frac{2 \times (C_{27})}{C_{26} + C_{28}}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 7
 CARBON ISOTOPE COMPOSITIONS (‰, PDB)

JOB 8237								
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	TOTAL EXTRACT WHOLE OIL	SATURATES	AROMATICS	NSO	ASPHALTENES	KEROGEN	DISTILLATE

8237-019	HA 584		-28.42					
8237-019	HA 584	-28.70	-28.52	-28.25	-27.73	-28.09		-29.12

TABLE 8

HYDROGEN AND SULPHUR ISOTOPE COMPOSITIONS

GEOCHEM SAMPLE NUMBER	FINA IDENTIFICATION	δD (‰, SMOW)	δS (‰, CDT)
8327-019	HA 584	-147.0, -147.1	ndp

() - small sample, treat data with caution

ndp - no determination possible sample prepared and analysed, insufficient SO₂ to measure

TABLE 9
DETAILED GASOLINE RANGE (C₄-C₇) COMPOSITION

GEOCHEM SAMPLE NUMBER	8237-019
DEPTH	HA 584
NORMALISED COMPOSITION	
isobutane	0.71
n-butane	4.56
isopentane	5.62
n-pentane	9.22
2,2-dimethylB	0.15
cyclopentane	1.90
2,3-dimethylB	0.62
2-methylP	5.28
3-methylP	3.19
n-hexane	9.62
methylCP	7.25
2,2-dimethylP	0.49
2,4-dimethylP	0.02
2,2,3-trimethylB	0.00
benzene	2.46
cyclohexane	7.14
3,3-dimethylP	0.00
1,1-dimethylCP	0.00
2-MH	4.44
2,3-dimethylP	0.25
3-MH	3.31
1,c,3-DMCP	1.36
1,t,3-DMCP	1.34
1,t,2-DMCP	2.54
3-ethylP	0.00
n-heptane(nC7)	9.15
methylCH	13.38
1,c,2-DMCP	0.00
toluene	6.00
ABUNDANCE	283780
nC7/C7NAPHTHENES	0.49
total MH/DMCP	1.48
1,t,2-/1,c,2-DMCP	0.00
nC6/methylCP	1.33
C6-C7 FRACTION	
%n-PARAFFINS	24.07
%iso-PARAFFINS	22.76
% NAPHTHENES	42.33
% AROMATICS	10.85

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 10
 DETAILED GASOLINE RANGE (C₄-C₇) COMPOSITION

GEOCHEM SAMPLE NUMBER	8237-019
DEPTH	HA 584
PPM COMPOSITION	
isobutane	2015
n-butane	12940
isopentane	15948
n-pentane	26165
2,2-dimethylB	426
cyclopentane	5392
2,3-dimethylB	1759
2-methylP	14984
3-methylP	9053
n-hexane	27300
methylCP	20574
2,2-dimethylP	1391
2,4-dimethylP	57
2,2,3-trimethylB	0
benzene	6981
cyclohexane	20262
3,3-dimethylP	0
1,1-dimethylCP	0
2-MH	12600
2,3-dimethylP	709
3-MH	9393
1,c,3-DMCP	3859
1,t,3-DMCP	3803
1,t,2-DMCP	7208
3-ethylP	0
n-heptane(nC7)	25966
methylCH	37970
1,c,2-DMCP	0
toluene	17027
ABUNDANCE	283780
nC7/C7NAPHTHENES	0.49
total MH/DMCP	1.48
1,t,2-/1,c,2-DMCP	0.00
nC6/methylCP	1.33
C6-C7 FRACTION	
%n-PARAFFINS	24.07
%iso-PARAFFINS	22.76
% NAPHTHENES	42.33
% AROMATICS	10.85

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11
METHYLPHENANTHRENE INDICES (MPI)

DB 8237 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	SAMPLE TYPE	MPI 1		Rcalc		MPI 2	
			AREA	HEIGHT	AREA	HEIGHT	AREA	HEIGHT

8237-019	HA 584		0.70	0.73			0.75	0.75
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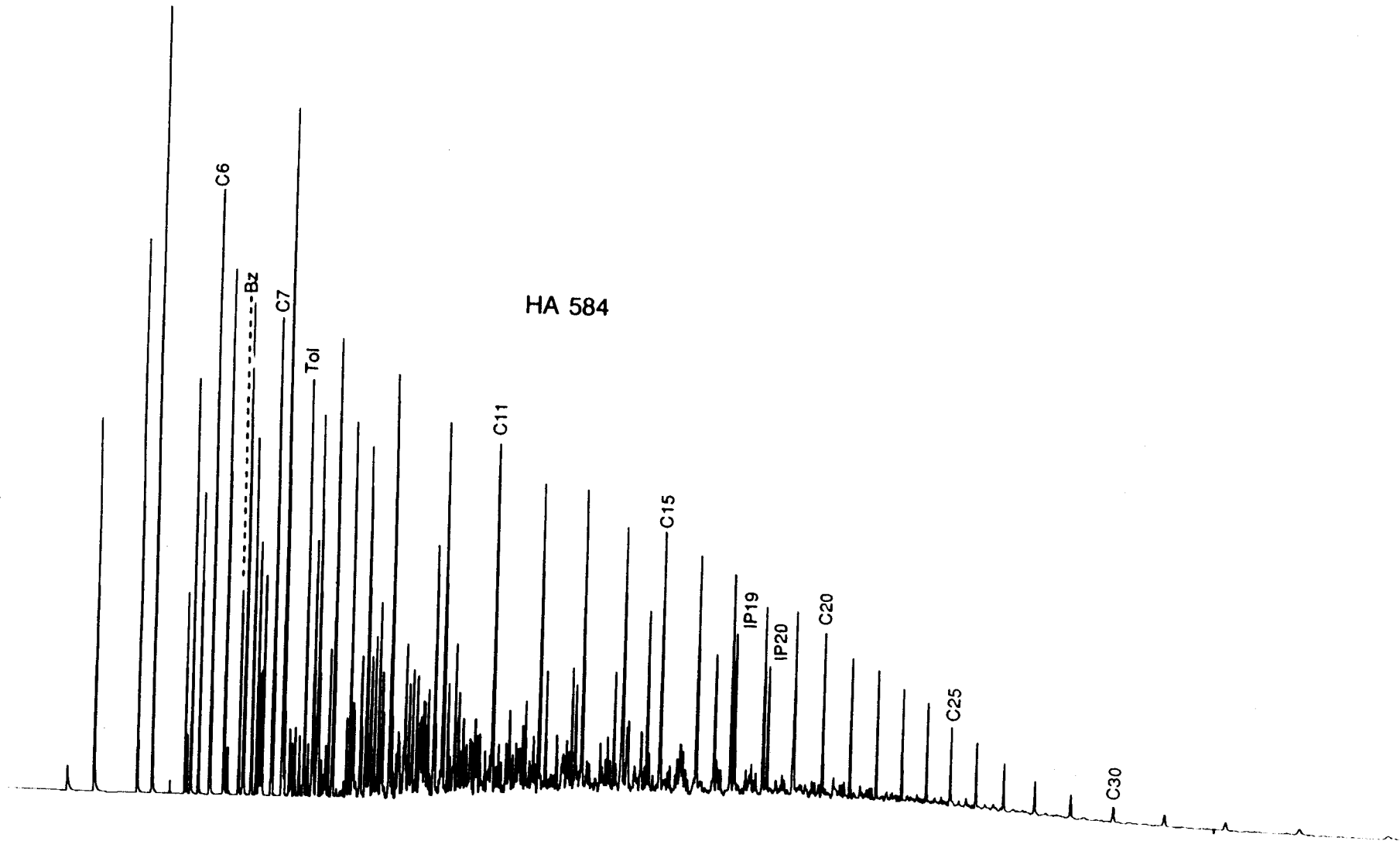
$$MPI 1 = \frac{1.5(2-MP + 3-MP)}{P + 1-MP + 9-MP}$$

$$MPI 2 = \frac{3(2-MP)}{P + 1-MP + 9-MP}$$

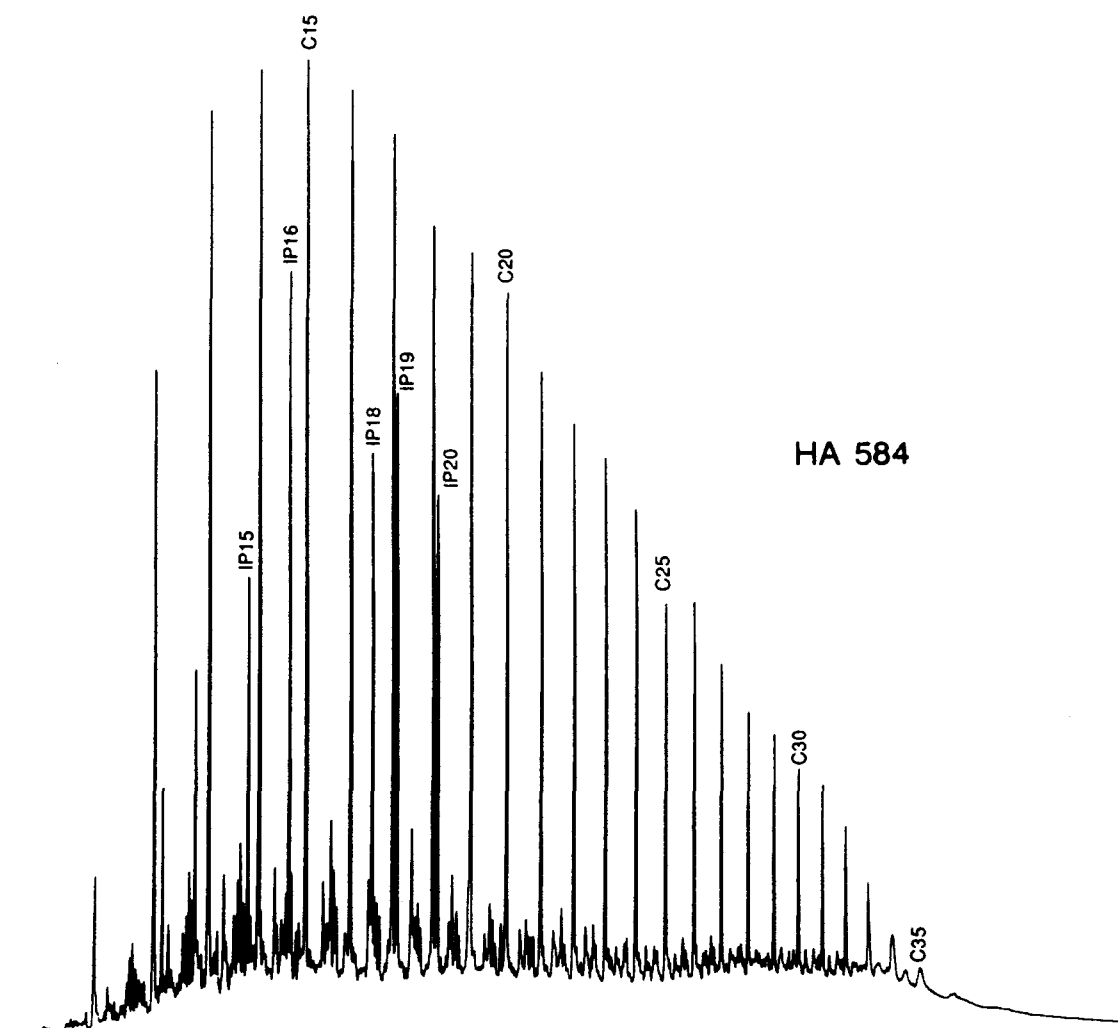
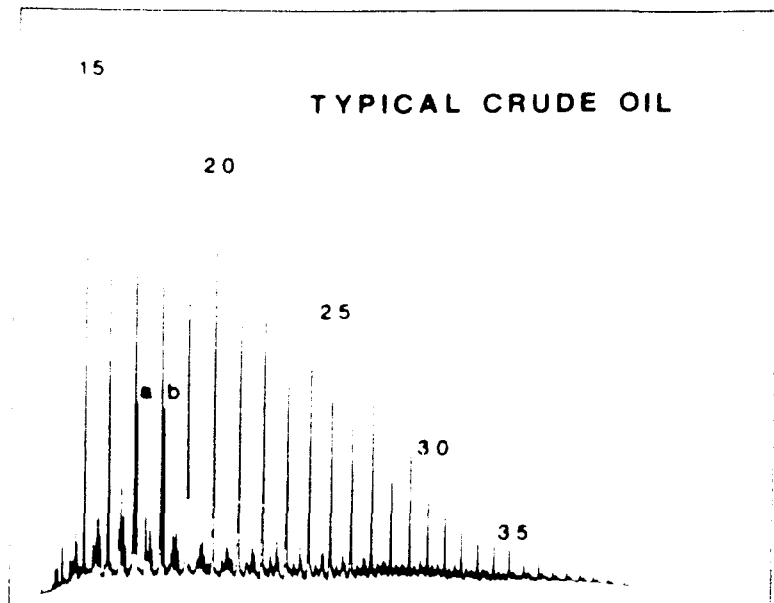
$$R_{calc} = \begin{cases} 0.60(MPI 1) + 0.40 & \text{(if } R_o < 1.35\% \text{)} \\ -0.60(MPI 1) + 2.30 & \text{(if } R_o > 1.35\% \text{)} \end{cases}$$

CT - ditch cuttings CO - core SWC - sidewall core

WHOLE OIL CHROMATOGRAMS



C₁₅+ SATURATES CHROMATOGRAMS

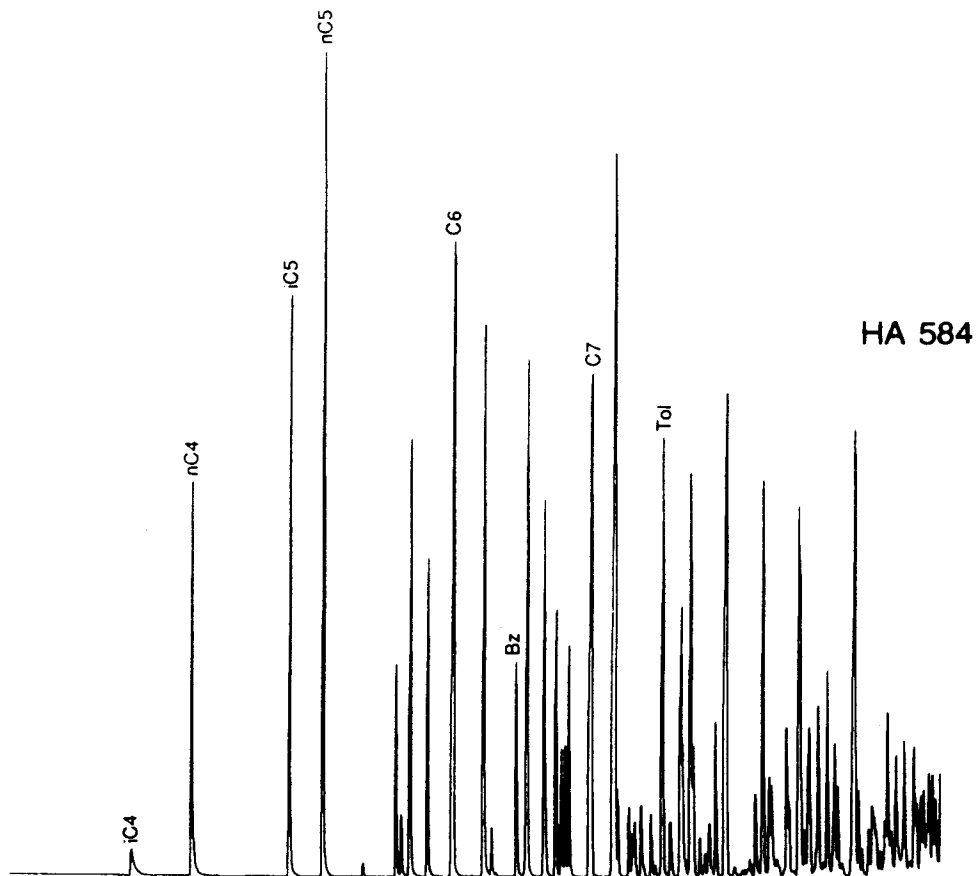


a = PRISTANE

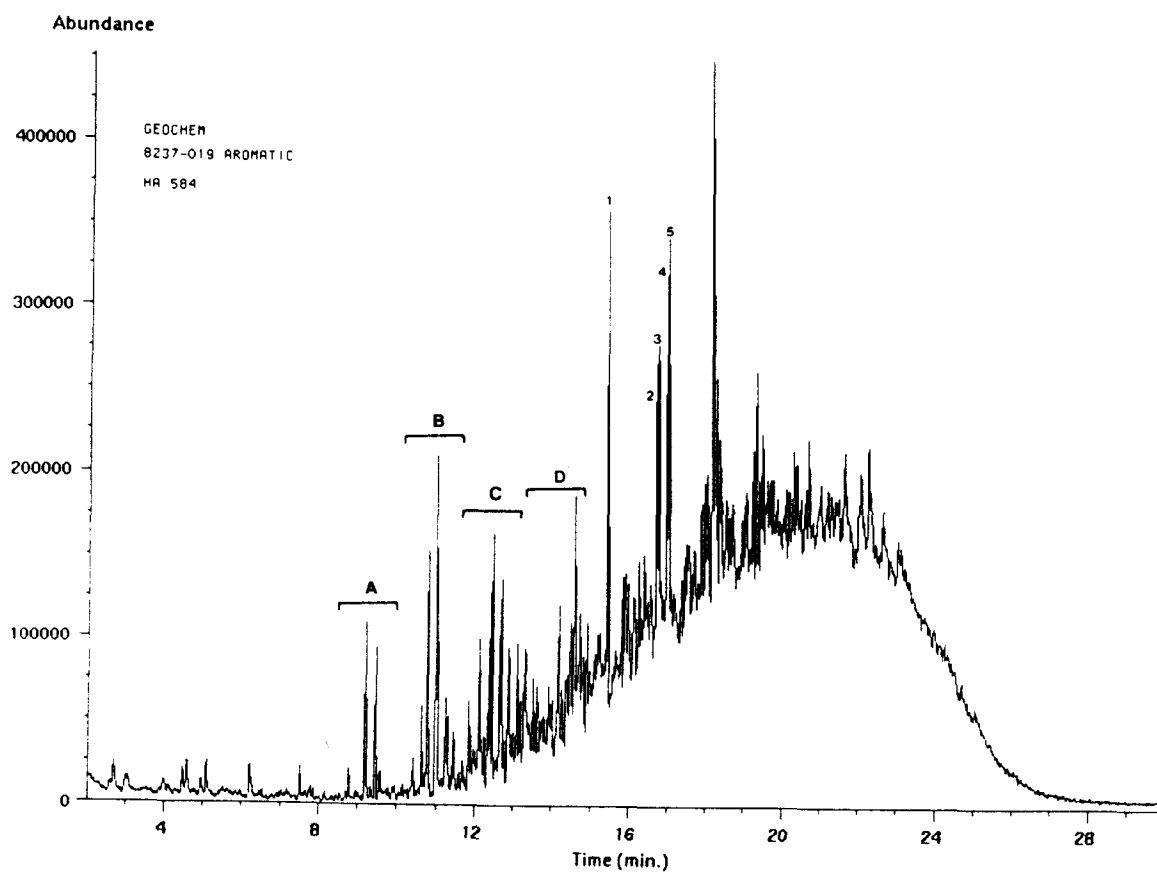
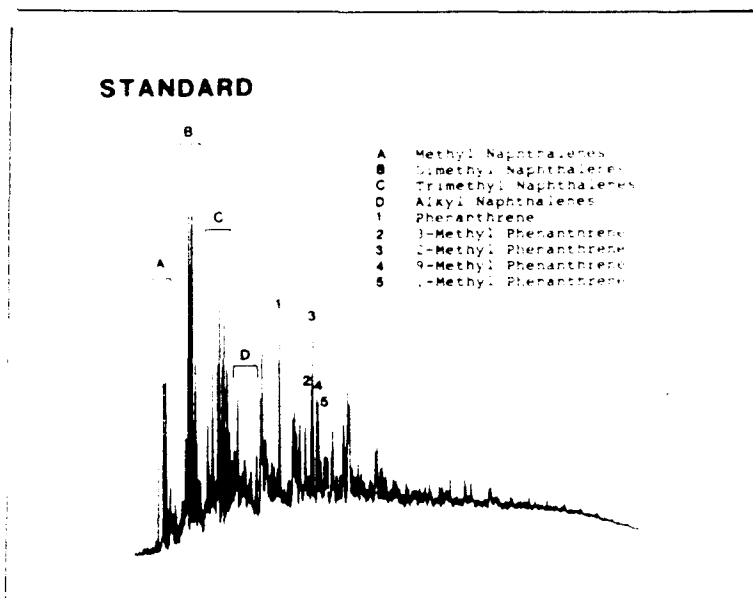
b = PHYTANE

CARBON NUMBERS OF NORMAL PARAFFINS INDICATED (20 - nC 20)

GASOLINE RANGE CHROMATOGRAMS



C₁₅+ AROMATIC CHROMATOGRAMS



C₁₅₊ ORGANOSULPHUR CHROMATOGRAMS

