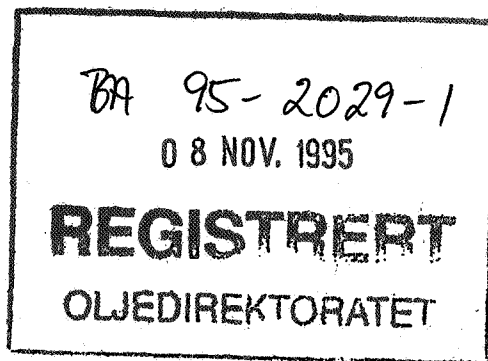


EP/P/EXP/GDP
95-033 RP

Pau, October 1995

**Norway
WELL 1/3-7**

**Reservoir geochemical study
of the Forties Fm
(Cores and DST 1A)**



Exploration

Département Genèse et Dynamique Pétrolière

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TABLES

Well 1/3-7 - Geochemical assessment of core extracts

REF.	CORE	TOC- ROCK EVAL						EXTRACT ANALYSIS							CORE ANALYSIS			HC SATURAT	
		Nr	DEPTH	TOC	S1	S2	S1+S2	PI	EOM	Yield	SAT	ARO	POL	S/A	HC	K	Phi	RhoR	SHre
		m	%					ppm	%	%	%	%			mD	%	g/cm3	%	%
B74658	K4	3226.10	0.27	1.64	0.58	2.22	0.74	3270	121.0	73.4	18.8	7.8	3.9	3.01	17.90	21.9	2.65	2.91	4.39
B74659	K4	3226.72	0.28	1.92	0.53	2.45	0.78	3690	131.9	73.3	18.3	8.4	4.0	3.38	23.30	21.8	2.65	3.23	4.98
B74660	K4	3227.22	0.16	0.33	0.16	0.49	0.67	1220	76.4	60.7	21.4	17.9	2.8	1.00	0.69	19.6	2.66	0.73	1.87
B74661	K4	3227.88	0.15	0.75	0.22	0.97	0.77	1980	131.7	67.7	19.3	13.0	3.5	1.72	36.20	24.8	2.65	1.10	2.30
B74662	K4	3228.80	0.16	0.04	0.08	0.12	0.33	580	35.9	17.8	24.1	58.0	0.7	0.24	0.09	12.7	2.68	0.30	1.45
B74663	K4	3229.40	0.21	0.80	0.36	1.16	0.69	2470	117.5	63.9	21.3	14.8	3.0	2.10	1.68	22.1	2.66	1.51	3.30
B74664	K4	3229.91	0.15	0.66	0.28	0.94	0.70	2110	140.4	64.5	21.2	14.4	3.1	1.80	1.90	19.9	2.65	1.38	3.16
B74665	K4	3230.55	0.15	0.47	0.28	0.75	0.63	2070	138.3	56.3	25.9	17.7	2.2	1.71	0.23	15.1	2.67	1.52	4.26
B74666	K4	3231.05	0.32	1.54	0.68	2.22	0.69	4400	137.7	58.9	27.5	13.6	2.1	3.81	10.70	21.8	2.65	2.93	5.94
B74667	K4	3231.66	0.22	0.23	0.24	0.47	0.49	1120	50.9	47.6	28.6	23.8	1.7	0.85	0.14	13.9	2.67	1.04	2.52
B74668	K4	3232.30	0.08	0.08	0.08	0.16	#	420	52.3	47.7	23.8	28.4	2.0	0.30	0.49	17.1	2.66	0.28	0.75
B74669	K4	3232.85	0.06	0.02	0.04	0.06	#	280	46.5	38.4	23.2	38.4	1.7	0.17	0.58	18.2	2.66	0.10	0.47
B74670	K4	3233.87	0.07	0.03	0.10	0.13	#	180	26.3	29.5	21.6	49.0	1.4	0.09	0.11	11.9	2.66	0.34	0.48
B74671	K4	3234.88	0.03	0.00	0.05	0.05	#	120	38.3	27.7	22.8	49.4	1.2	0.06		23.4	2.66	0.06	0.15
B74672	K4	3236.12	0.04	0.00	0.07	0.07	#	110	27.8	25.7	24.3	50.0	1.1	0.06	4.58	23.0	2.65	0.09	0.14
Formula used for calculation of Hydrocarbon Saturation (after J.H. Augustson, 1991)																			
Based on Rock Eval : SHre = (S1+S2)*RhoB/(RhoH*sigma*10) where RhoB = (sigma*RhoH)+((100-sigma)*RhoR)																			
Based on Rock Extract : SHeom = EOM (%)*(RhoW/RhoH+(RhoR/RhoH)*(100-sigma)/sigma)																			
Phi and RhoR are from Geco Prakla petrophysical measurements																			
RhoH = density of reservoir fluid (estimated to 0.78)																			
RhoW = density of pore water (estimated to 1.03)																			

Well 1/3-7 Geochemical characterization of DST1A

Well 1/3-7	Condensate						
Sample	DST 1A	Carbon isotope of individual HC (whole oil)					
Depth top (m RKB)	3183.5	No	Components	Delta C	No	Components	Delta C
Depth bottom (m RKB)	3215.5	1	iC4		37	2MNon	
		2	nC4	-26.28	38	o-EtTol	
		3	iC5	-28.73	39	3,6DMOct	
		4	nC5	-27.42	40	IPC10	-29.14
Bulk properties of whole oil							
API gravity	44.28	5	CYPent		41	nC10	-28.86
% Sulphur	0.052	6	2,3DMBut		42	4MC10	
% Residue of distillation	53.68	7	2MPent	-27.59	43	IPC11	-28.86
Gross composition of whole oil							
% Distillate	46.32	8	3MPent	-29.88	44	nC11	-29.26
% "C15+" Saturated HC	39.55	9	nC6	-28.24	45	4MC11	
% "C15+" Aromatic HC	12.21	10	MCP	-27.38	46	IPC12	
% Resins	1.92	11	Bz	-30.45	47	nC12	-29.52
% Asphaltenes	0.00	12	CH	-28.25	48	IPC13	-29.16
		13	2MHex	-29.26	49	IPC14	-28.98
Gross composition of oil residue							
% "C15+" Saturated HC	73.68	14	3MHex	-29.56	50	nC13	-29.53
% "C15+" Aromatic HC	22.74	15	1,3 trDMCyPent		51	IPC15	-29.49
% Resins	3.58	16	1,3 ciDMCyPent		52	nC14	-30.11
% Asphaltenes	0.00	17	1,2 trDMCyPent	-32.01	53	IPC16	-29.37
Saturates/Aromatics	3.24	18	nC7	-29.08	54	nC15	-29.78
% Hydrocarbons	96.42	19	MCH	-27.21	55	nC16	-30.11
% n-alkanes (in saturates)	20.35	20	Tol	-29.48	56	IPC18	
CPI (C20 to C30)	1.01	21	2MHept		57	nC17	-30.20
		22	3MHept	-29.18	58	Pristane (Pr)	-31.18
GC ratios on C15-							
nC6/MCP	2.99	23	1tr2DMCHex	-29.88	59	nC18	-30.53
nC7/DMCP	9.06	24	nC8	-28.93	60	Phytane (Ph)	
nC7/Toluene	1.44	25	n-PrCyPent	-27.35	61	nC19	-30.32
		26	1-cis-2DMCyHex		62	nC20	-30.58
GC ratios on C15+							
Pr/Ph	1.44	27	1,1,3 TMCyHex		63	nC21	-30.48
Pr/nC17 (A)	0.37	28	EtBz		64	nC22	
Ph/nC18 (B)	0.29	29	p+m-Xyl	-28.95	65	nC23	
A/B	1.28	30	2MOct	-29.82	66	nC24	
		31	3MOct	-29.29	67	nC25	
Carbon isotope composition							
Whole oil	-28.4	32	o-Xyl	-30.53	68	nC26	
Topped oil	-28.5	33	nC9	-28.98	69	nC27	
C15+ saturates	-28.9	34	TeBuCyPent		70	nC28	
C15+ aromatics	-28.0	35	SeBuCyPent		71	nC29	
		36	n-PrCyHex		72	nC30	
Gas gross composition				Gas isotope composition			
% C1	72.17		C1	-47.1	δH	C1	na
% C2	12.85		C2	-27.2			
% C3	7.35		C3	-25.4			
% iC4	1.20		iC4	-30.7			
% nC4	2.21		nC4	-26.9			
% iC5	0.40		iC5	-30.8			
% nC5	0.30		nC5	-29.8			
% CO2	1.69		CO2	na	δO	CO2	na
% N2	1.84						
% H2S	nd						
C1/C1-C4	0.75						
C1/C1+C3	3.57						
iC4/nC4	0.54						

ANNEXES

Country **ON**
1/3-7

Identification **HT DST 1A**
3163.50 3316.50
(Lab. Ref. B75412)

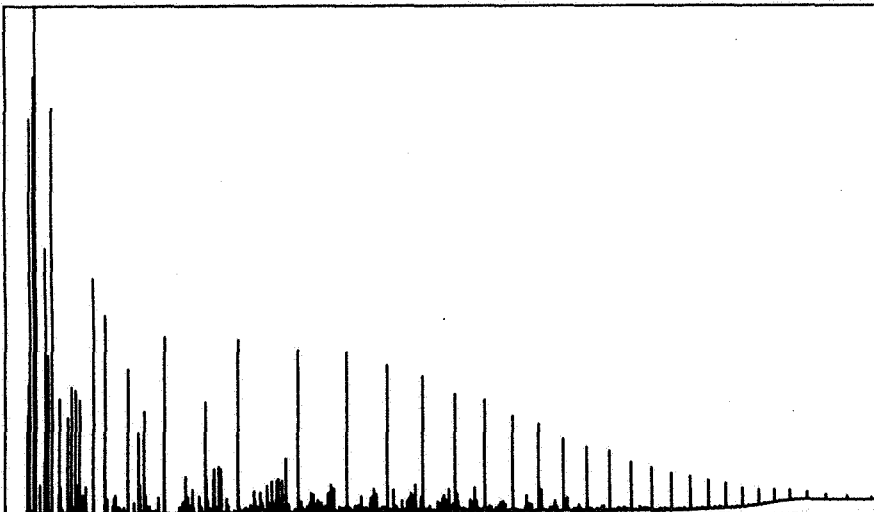
spe. gra. 15C **.8058**
d API **44.28**
Sulphur (%) **0.0**

d13C HT **-28.4**
d13C RD **-28.5**
d13C SAT **-28.9**
d13C ARO **-28.0**

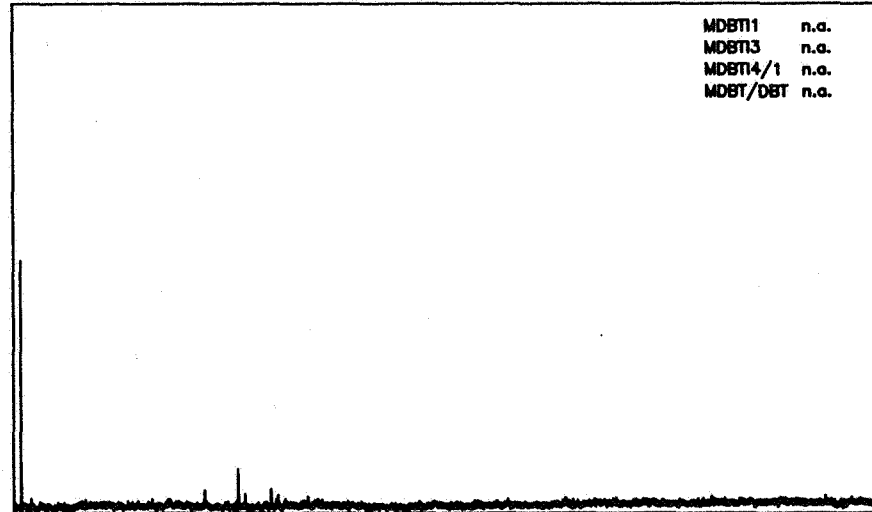
Distillate	46.32	(% HT)	
HC SAT [C14+]	39.55	(% HT)	73.68 (% RD)
HC ARO [C14+]	12.21	(% HT)	22.74 (% RD)
Resins	1.92	(% HT)	3.58 (% RD)
Asphaltenes	0.00	(% HT)	0.00 (% RD)
SAT/ARO	3.24		

INTERPRETATION

Biodegradation: Unnoticed - Washing: Unnoticed - Maturity Eq VRo X: 0.5/0.7 - Source Rock Probable of Age J

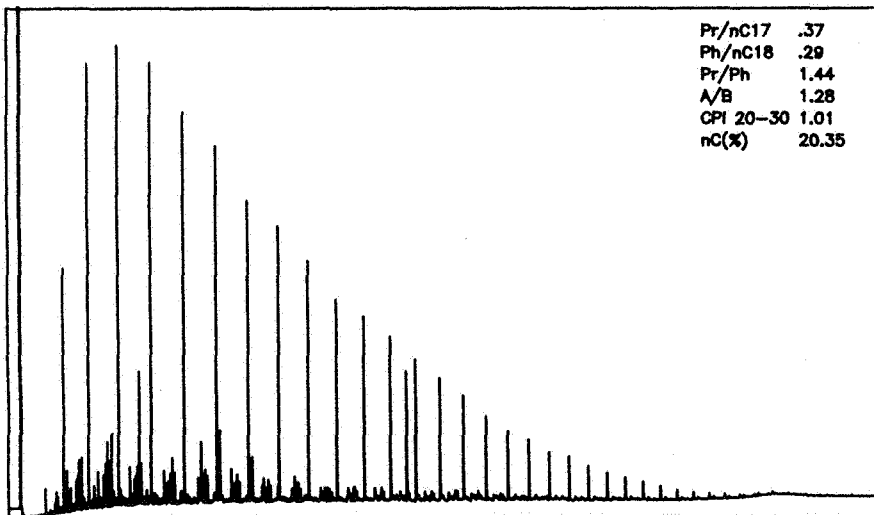


TOTAL OIL (ID-B7541)



SULFUR COMPOUNDS (FP-B7541)

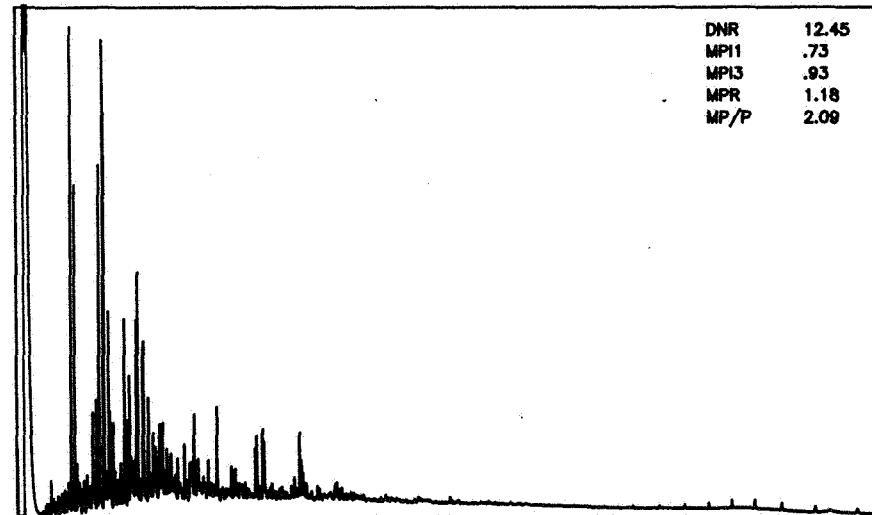
MDBT1 n.a.
MDBT3 n.a.
MDBT4/1 n.a.
MDBT/DBT n.a.



SATURATED HC (ST-B7541)

Pr/nC17 **.37**
Ph/nC18 **.29**
Pr/Ph **1.44**
A/B **1.28**
CPI 20-30 **1.01**
nC(%) **20.35**

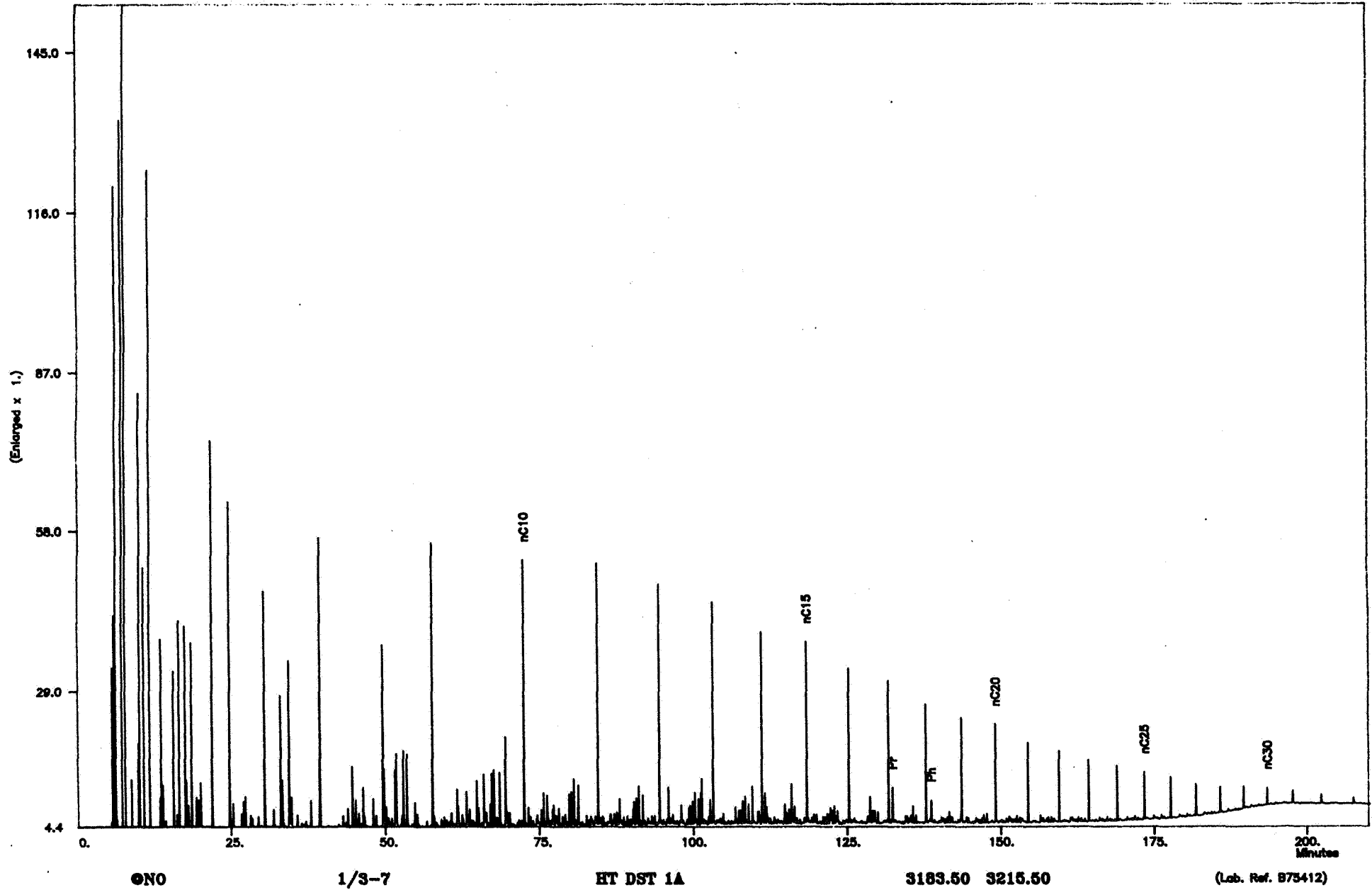
GC/MS carried out



AROMATIC HC (FI-B7541)

DNR **12.45**
MPI1 **.73**
MPI3 **.93**
MPR **1.18**
MP/P **2.09**

CHROMATOGRAMME "HUILE TOTALE" / CHROMATOGRAM "TOTAL OIL"

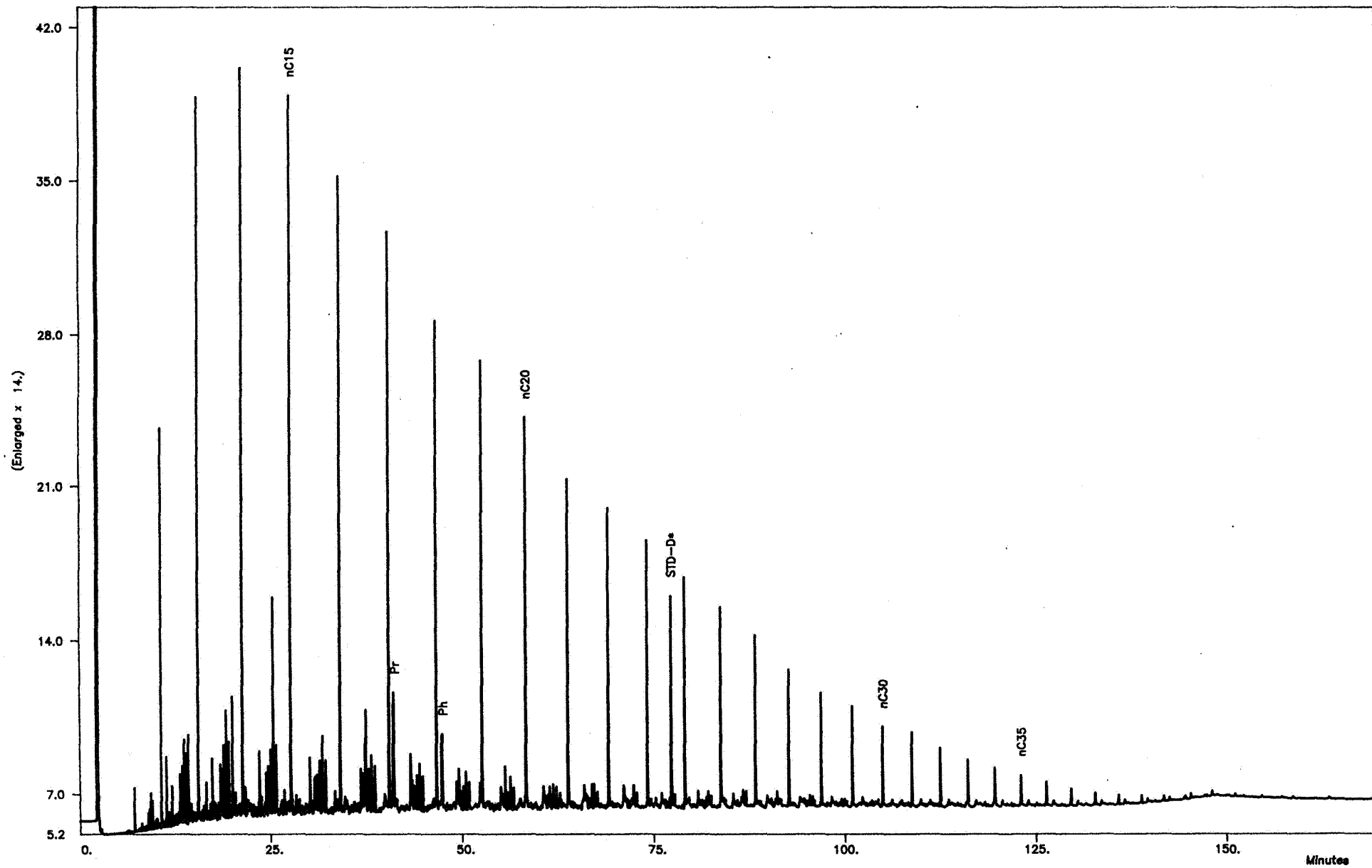


EP/P/EXP/GDP/95-038RP

Elf aquitaine production

Ann. 2

CHROMATOGRAMME "HC SATURES" / CHROMATOGRAM "SATURATED HC"



●NO

1/3-7

HT DST 1A

3183.50 3215.50

(Lab. Ref. B75412)

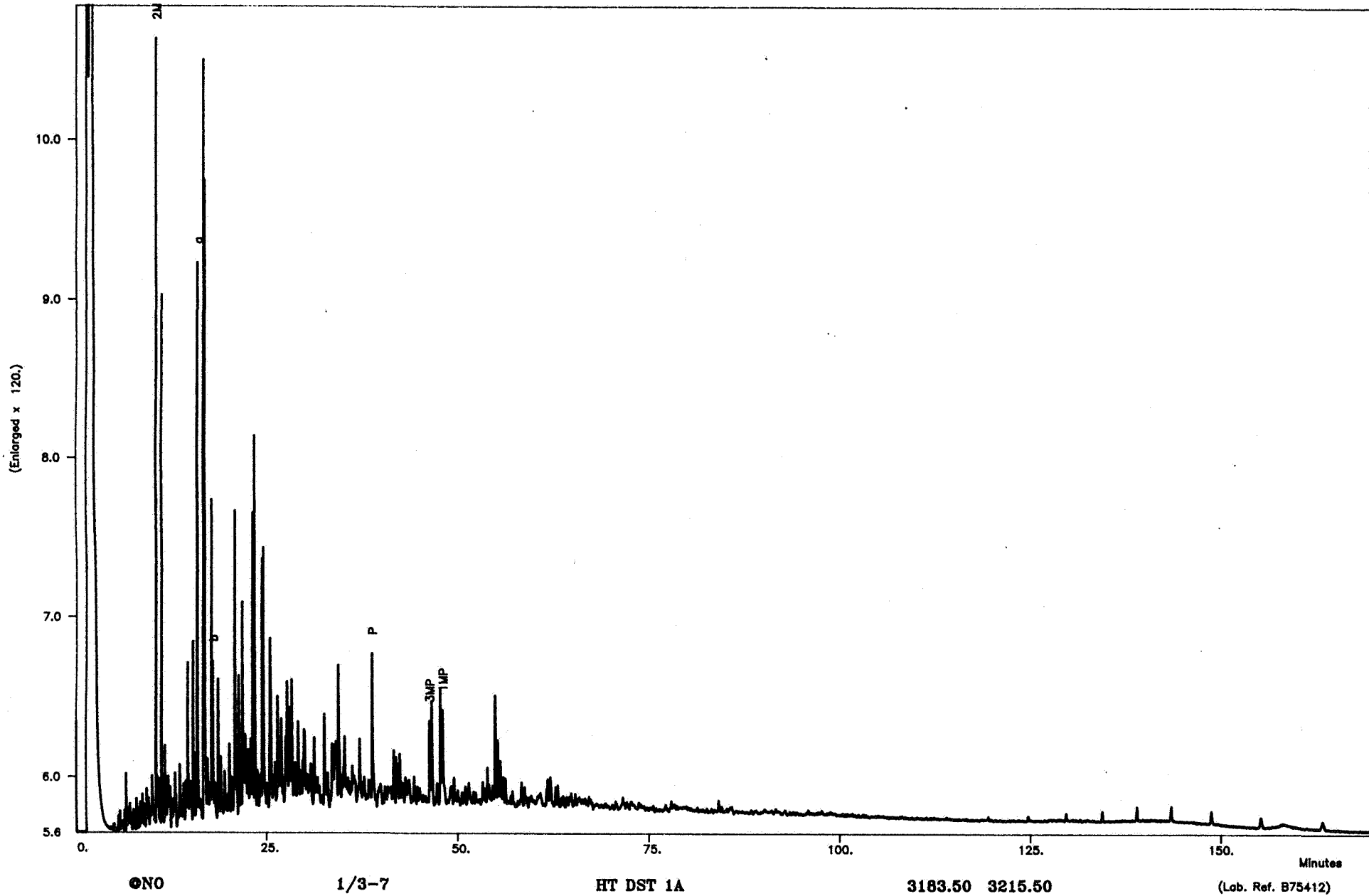
EPI/EXP/GDP/95-033RP

Elf aquitaine production



Ann. 3

CHROMATOGRAMME "HC AROMATIQUES" / CHROMATOGRAM "AROMATIC HC"

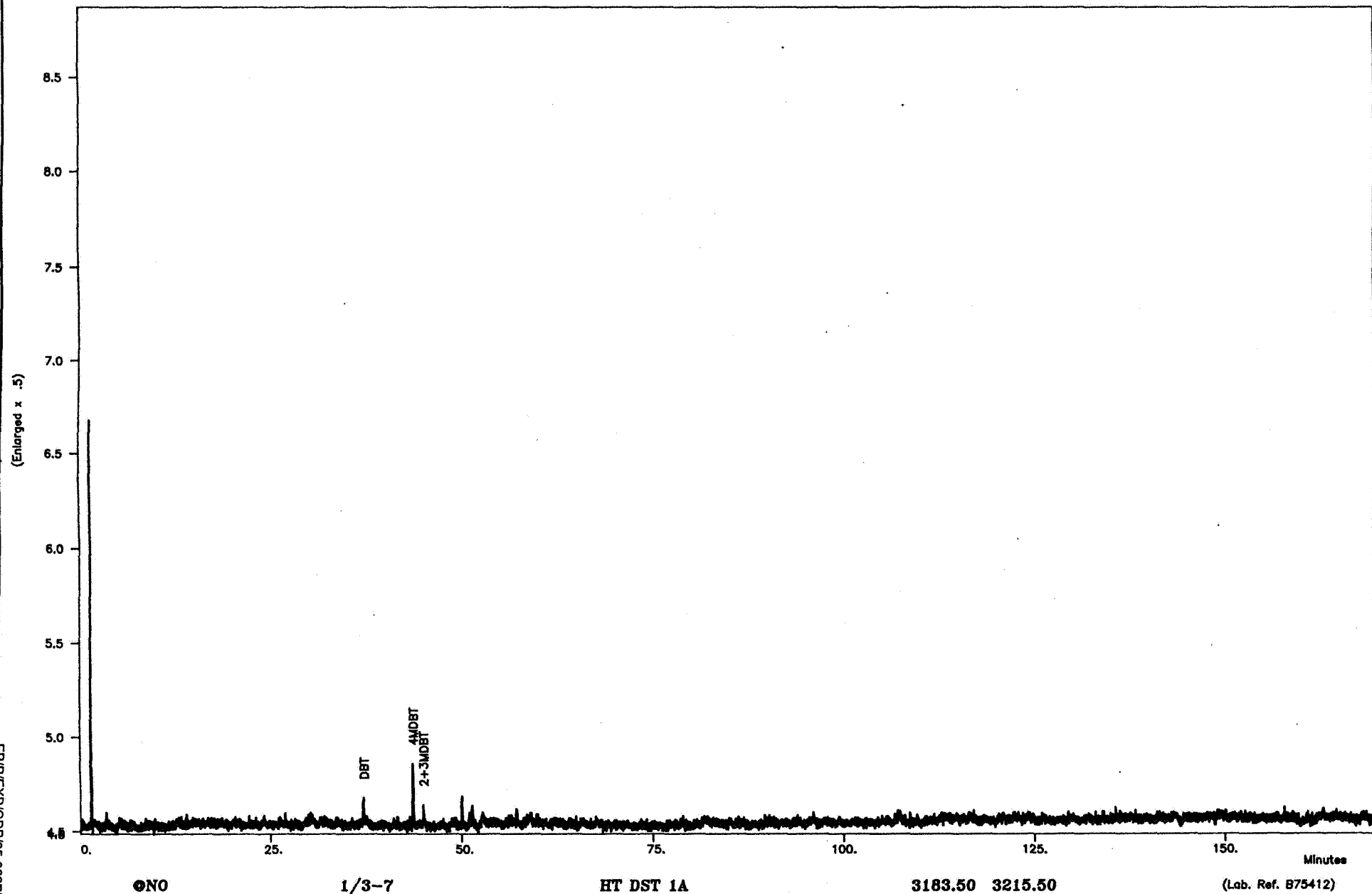


EPI/EXP/GDP/95-033RP

elf aquitaine production

Ann.4

CHROMATOGRAMME "COMPOSES SOUFRES" / CHROMATOGRAM "SULFUR COMPOUNDS"



EP/P/EXP/GDP/95-033RP

Elf aquitaine production

Ann. 5

PROGRAMME POST-ANALYSE: GC-SAT
 Fichier: ST_B75412
 Nom échantillon: 1/3-7 Hn°03529P
 Date injection: 21-08-95 à 20 heures

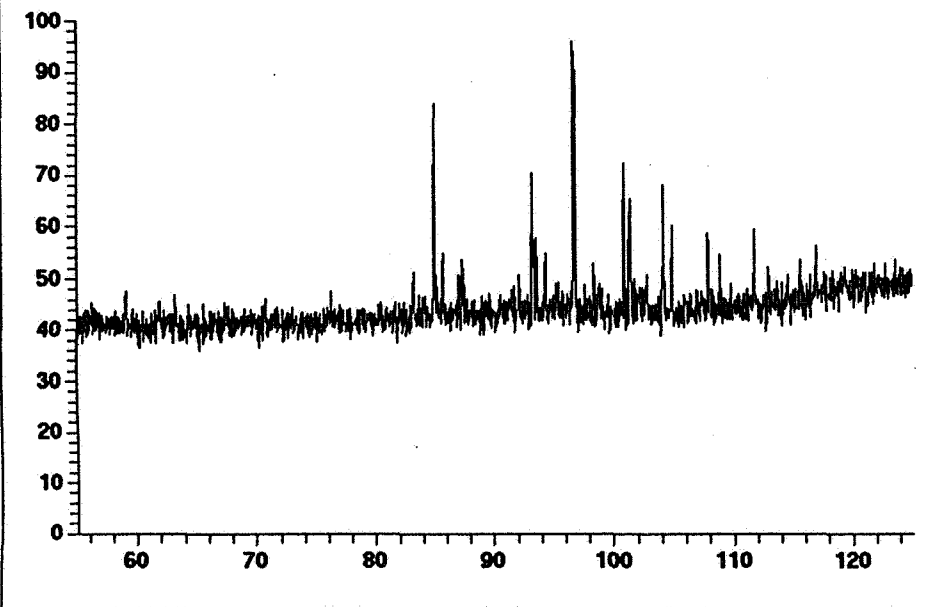
Il manque le	nC10		(1)	.
Surface	IPC11	545.	(41)	>
Surface	nC11	6204.	(2)	+>
Surface	nC12	74501.	(3)	+----->
Surface	IPC13	19242.	(42)	+---->
Surface	IPC14	24384.	(43)	+---->
Surface	nC13	174427.	(4)	+----->
Surface	IPC15	43672.	(44)	+----->
Surface	nC14	233786.	(5)	+----->
Surface	IPC16	98943.	(45)	+----->
Surface	nC15	239422.	(6)	+----->
Surface	nC16	233206.	(7)	+----->
Surface	IPC18	25907.	(46)	+---->
Surface	nC17	218302.	(8)	+----->
Surface	Pr1	39872.	(37)	+----->
Surface	Pr	39899.	(38)	+----->
Surface	nC18	194160.	(9)	+----->
Surface	Ph1	27927.	(39)	+----->
Surface	Ph	27423.	(40)	+----->
Surface	IPC21	1573.	(47)	>
Surface	nC19	167588.	(10)	+----->
Surface	nC20	155208.	(11)	+----->
Surface	nC21	134248.	(12)	+----->
Surface	nC22	121435.	(13)	+----->
Surface	nC23	105621.	(14)	+----->
Surface	STD_D*	130055.	(48)	+----->
Surface	nC24	96303.	(15)	+----->
Surface	nC25	79770.	(16)	+----->
Surface	nC26	69864.	(17)	+----->
Surface	nC27	58327.	(18)	+----->
Surface	nC28	47735.	(19)	+----->
Surface	nC29	46234.	(20)	+----->
Surface	nC30	32254.	(21)	+----->
Surface	nC31	30791.	(22)	+----->
Surface	nC32	25616.	(23)	+----->
Surface	nC33	20734.	(24)	+---->
Surface	nC34	25933.	(25)	+----->
Surface	nC35	15278.	(26)	+---->
Surface	nC36	11433.	(27)	+>
Surface	nC37	6999.	(28)	+>
Surface	nC38	6388.	(29)	+>
Surface	nC39	5073.	(30)	+>
Surface	nC40	3698.	(31)	+>
Surface	nC41	2806.	(32)	+>
Surface	nC42	1414.	(33)	>
Surface	nC43	1400.	(34)	>
Il manque le	nC44		(35)	.
Il manque le	nC45		(36)	.

NB: STD_D* = étalon interne

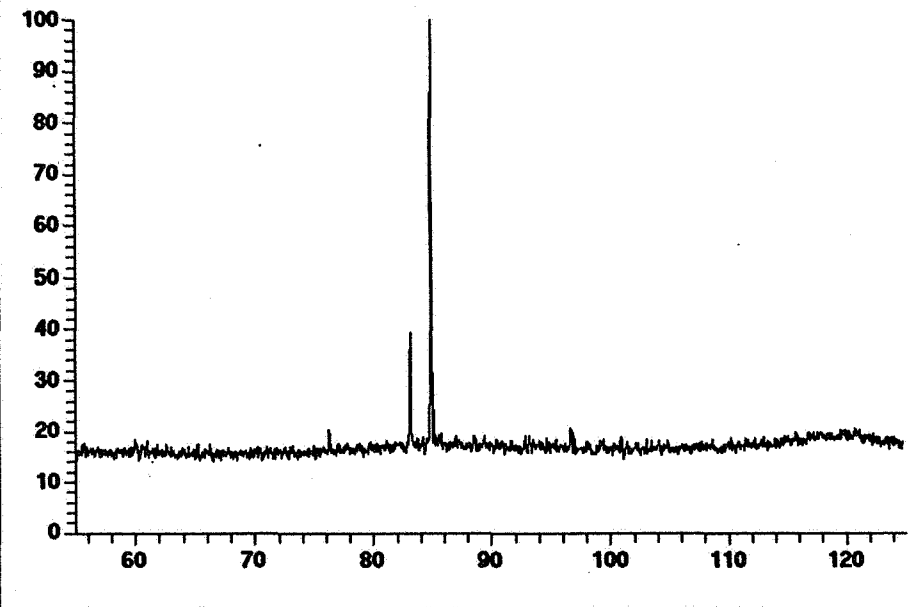
Pr/nC17	=	.37
Ph/nC18	=	.29
pr/ph	=	1.44
A/B	=	1.28
ph1/ph2	=	1.02
pr2/ph2	=	1.45
pr1/pr2	=	1.00
pr2/nC17	=	.18
ph2/nC18	=	.14
CPI. 14-34	=	1.00
CPI. 14-24	=	1.00
CPI. 22-34	=	1.01
CPI. 20-30	=	1.01
% n-alcanes dans saturés	=	20.35



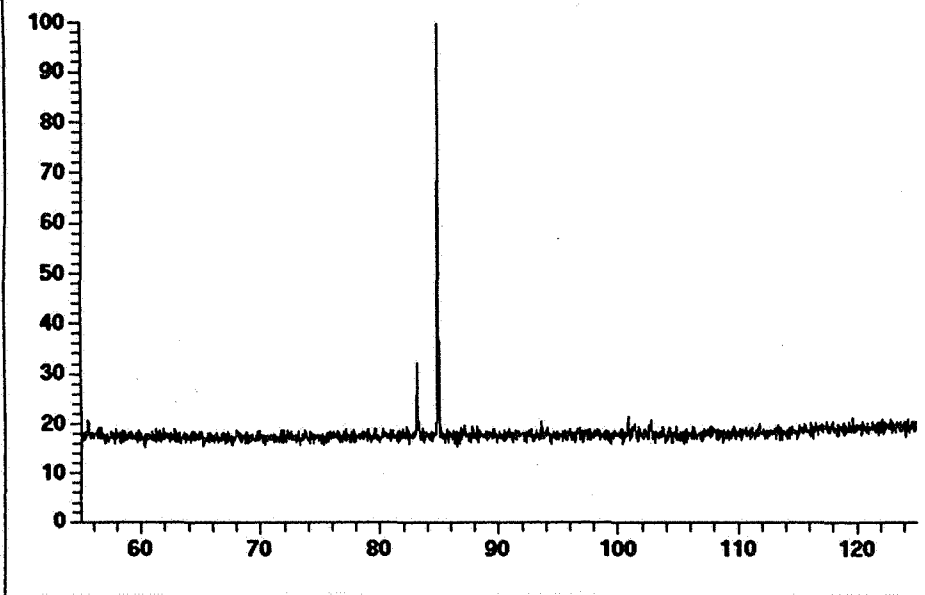
Ion 191.00 amu from B75412STM2.d; B75412;ST;NO;1/3-7;HT;DST1A;3183.5;3215.5;M
100% = 765



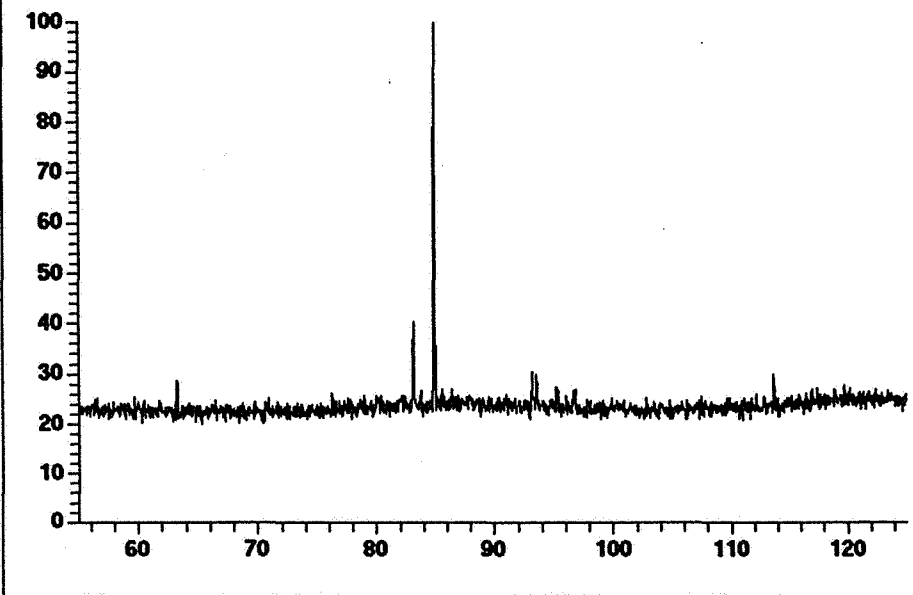
Ion 123.00 amu from B75412STM2.d; B75412;ST;NO;1/3-7;HT;DST1A;3183.5;3215.5;M
100% = 6352

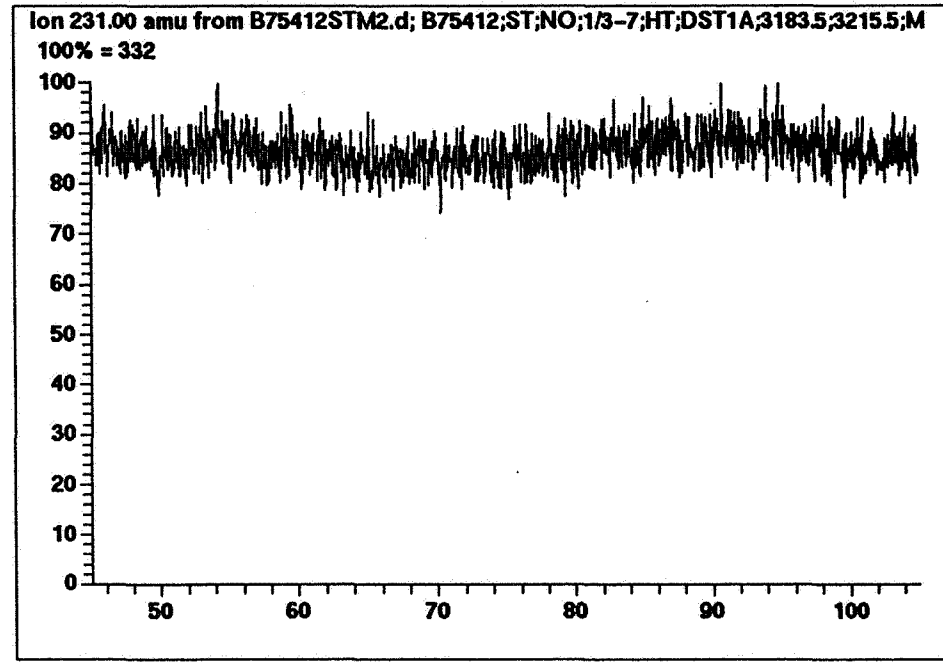
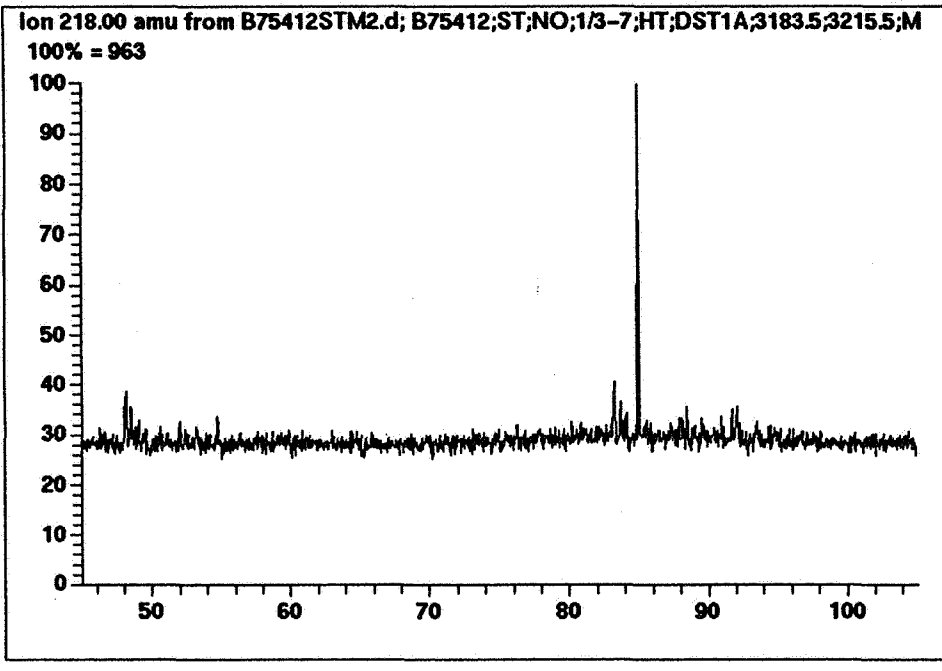
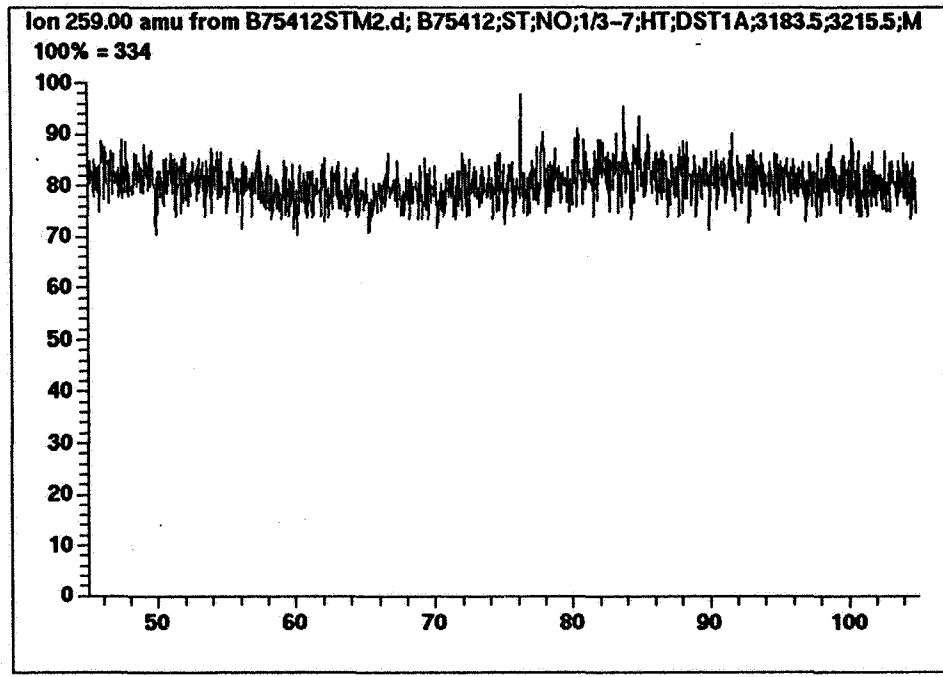
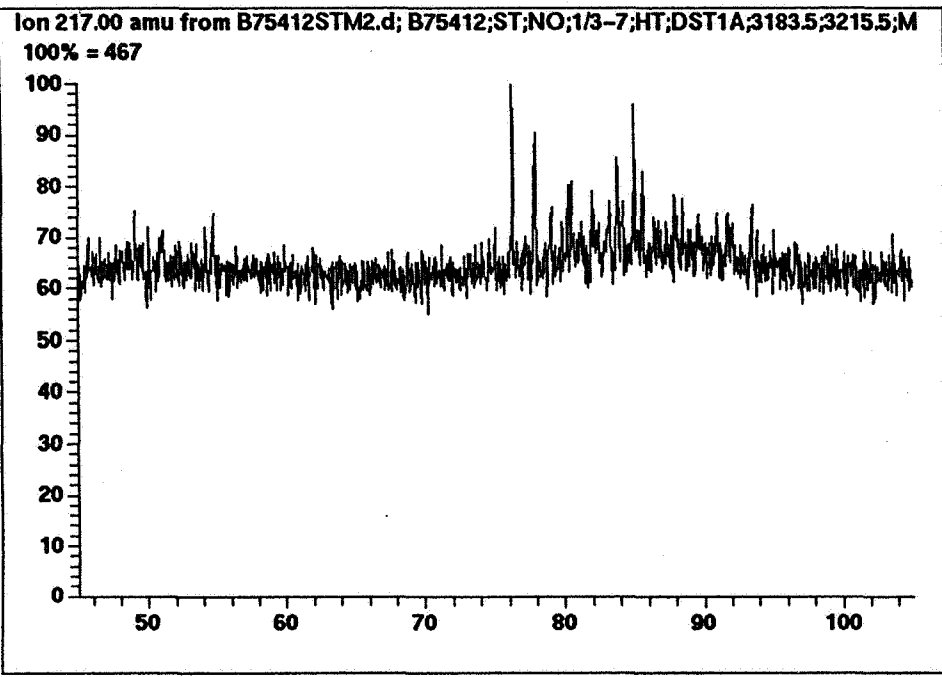


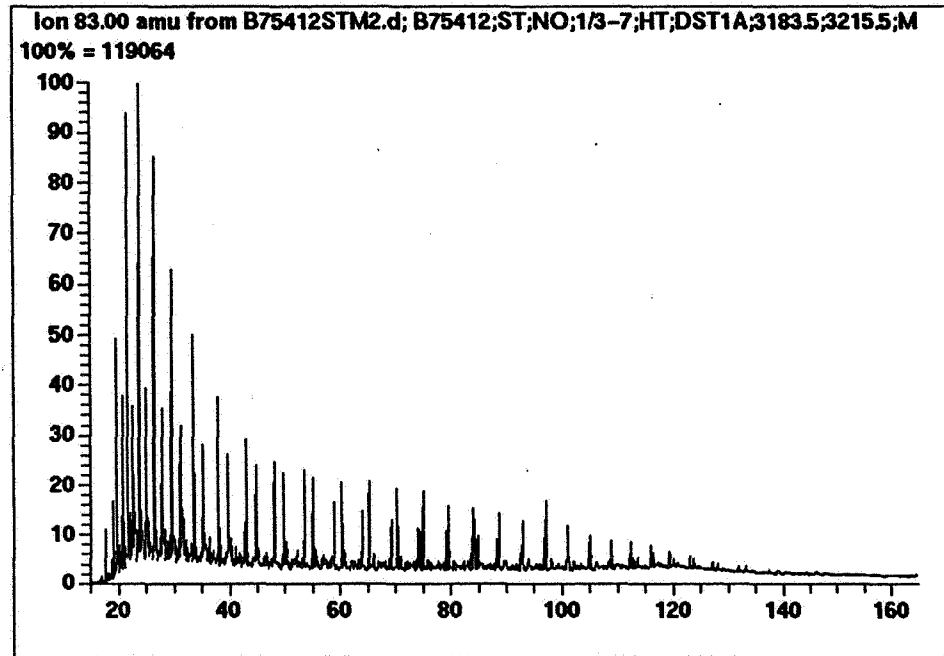
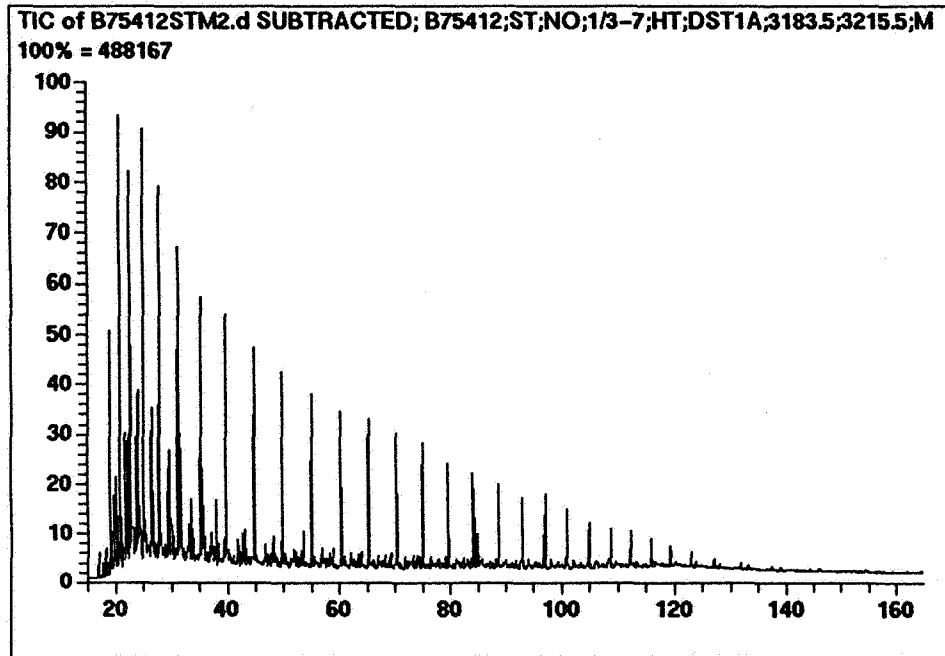
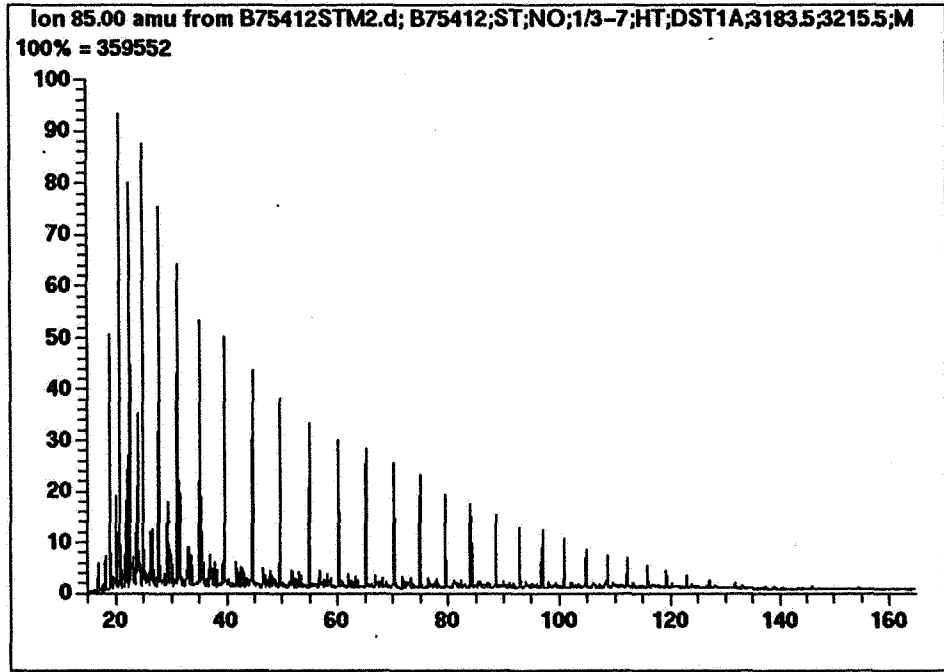
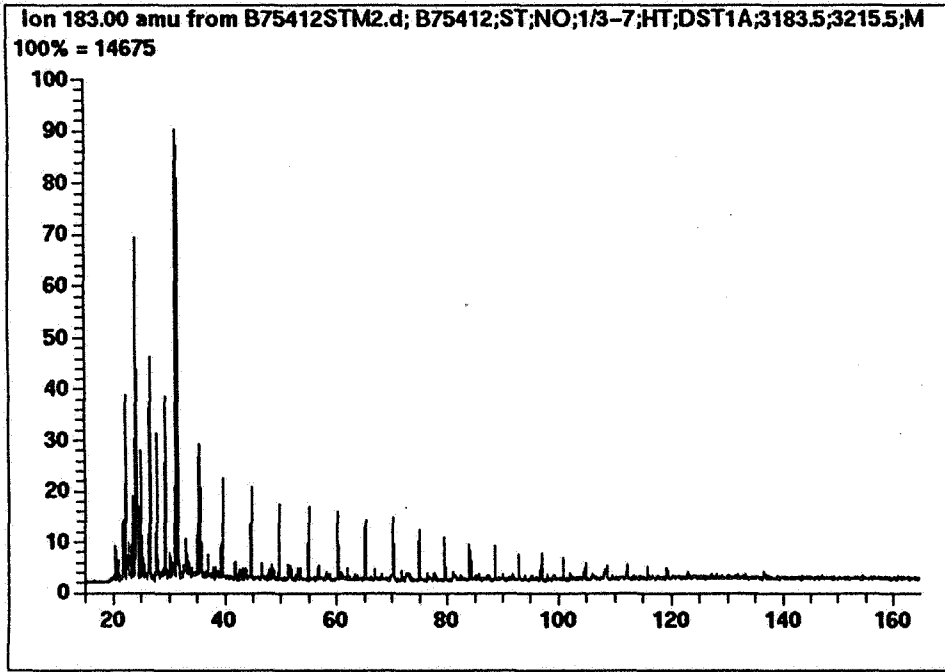
Ion 205.00 amu from B75412STM2.d; B75412;ST;NO;1/3-7;HT;DST1A;3183.5;3215.5;M
100% = 1752



Ion 177.00 amu from B75412STM2.d; B75412;ST;NO;1/3-7;HT;DST1A;3183.5;3215.5;M
100% = 1580







GC/MS Analysis of Saturated Hydrocarbons: Molecular Ratios.

DT LABUX B75412 (Mark 4225 set 95/233)
 1/3-7 (NO) DST 1A 3 183,50 - 3 215,50 (m) . Submitted by LE TRAN.
 Geochemical study.

Steranes

<u>Short chain steranes</u>	<u>Light / heavy steranes</u>	<u>% ββ steranes</u>	<u>Total integrations:</u>	
C21 / C22:	(C21+C22) /	C27ββ:	39.1 %	m/z 232 : 70.7 %
C22-4-m / C22:	(C29ααR+S):	C28ββ:	27.3 %	m/z 218 : 22.8 %
<hr/>		C29ββ:	33.6 %	m/z 259 : 6.6 %
<u>C27 steranes</u>	<u>C29 steranes</u>	<u>Diasteranes</u>		
ααS / ααR:	ααS / ααR : 0.57	C27SDia / C27ααR:		
ββR / ααR:	ββR / ααR : 0.73	C27SDia / C29ααR:	2.22	
ββS / ααR:	ββS / ααR : 0.69			
% ββ:	% ββ: 47.39 %			
% 20S :	% 20S : 42.11 %			

Terpanes

<u>Tricyclic terpanes:</u>	<u>βα hopanes:</u>	<u>Methylhopanes</u>	<u>Hexacyclics:</u>	
C23:3 / C24:4 : <Erre	C30βα / C30αβ : 0.21	(C30 / C31) 2α mH: :Erre	C32:6 / C29ααR: 0.00	
C23:3 / C29αβ : 0.00	<hr/>		C32:6 / C35αβ 0.00	
C30:3 / C29αβ: 0.00	<u>C31-C35 hopanes:</u>	(3β / 2α) C30 mH: <Erre	<hr/>	
<hr/>		2α mHop / Hop: 0.00	<u>Other terpanes:</u>	
<u>18α(H) Hopanes:</u>	% 22S C31: 57.5 %	<u>8,14 Secohopanes:</u>	GCRN / C30αβ : 0.00	
Ts / Tm: 1.00	% 22S C32: 60.4 %	C29-C30 / (C29+C30ab): 0.73	"X" / C30αβ: 0.25	
C29:5 / C29αβ: 0.53	% 22S C33: 60.4 %	<hr/>		
<hr/>		<u>25-Norhopanes</u>	OLN / C30αβ: 0.00	
<u>αβ Hopanes:</u>	% 22S C34: 62.1 %	TNH / BNH: <Erreur	BNH / C29αβ: 0.00	
C29αβ / C30αβ: 0.51	% 22S C35: 49.1 %	TNH / (Ts+Tm): 0.00	<hr/>	
C28αβ / C29αβ: 0.00	C31 / (C31+C32): 0.55	nor C29 / C29 αβ: 0.00	<u>Total integration:</u>	
C28αβ / (Ts+Tm): 0.00	C33 / C35: 1.42	Residual m/z 191 : -19.1 %		
<hr/>		C35 / (C29+C30): 0.24		

n & branched alkanes

Pr / Ph :
 Pr / nC17 :
 Ph / nC18 :
 A / B :
 CPI2 :
 CPI1 :
 n / (n+iso) alkanes : 0.70

Other ratios

C23:3 / C 21St : 0.00
 (27-30H) / 29St : 3.85
 m/z 191 / m/z 217 : 0.27
 Tri / Pentacyclics : 0.00
 C32 PCI / C32:6: <Erre

Quantitative Analysis

	ppm / sat	ppm / EOM-TO
Hopanes		
C29 H		
Tricyclics		
m/z 217		
C29ααR		
n-alkanes		

Comments