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APPENDICES

Table A1 Characterization of Catalysts

Catalysts	Composition of Catalysts (%wt.)									
	Cl	Ca	Mn	Fe	Co	Ni	Cu	Zn	Sn	Pt
Thai oil	D	D	0.44	0.76	D	0.28	0.20	D	0.74	1.86
Al_2O_3	D	D	0.25	0.28	D	D	0.23	0.13	ND	ND
MS	D	0.26	0.24	1.14	D	D	0.24	0.12	ND	ND
Fe 5-5-2/MS	0.10	0.50	0.30	12.2	ND	D	0.31	0.15	1.42	ND
Co 5-5-2/MS	D	1.20	0.34	1.20	5.41	0.16	0.29	0.15	3.47	ND
Ni 5-5-2/MS	0.13	0.90	0.31	0.92	D	8.97	0.13	0.14	4.79	ND
Ni 5-5-1/MS	0.14	1.28	0.40	0.93	ND	7.46	0.14	0.14	5.65	ND
Ni 5-2.5-2/MS	0.10	9.08	0.40	0.94	ND	7.85	0.14	0.14	2.54	ND
Ni 2.5-5-2/MS	0.09	1.10	0.32	0.86	ND	3.40	0.14	4.98	4.98	ND

Note : In all catalysts, XRFS detect Al, Si, Ti, Cr and Mo in ppm unit

D means XRFS detect in ppm unit

ND means XRFS cannot detect

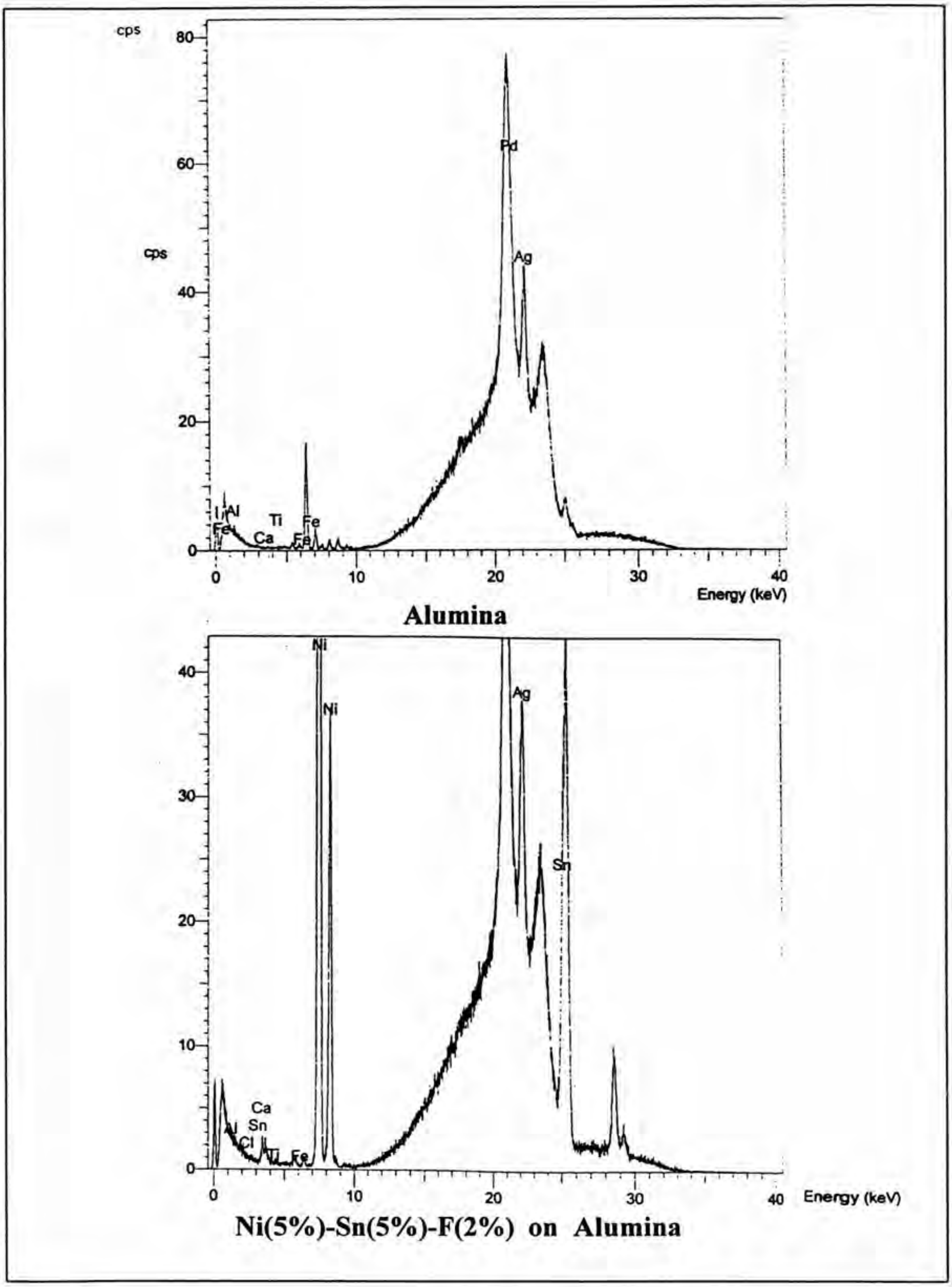


Figure A1 Plots of X-ray fluorescence data of alumina and catalyst type

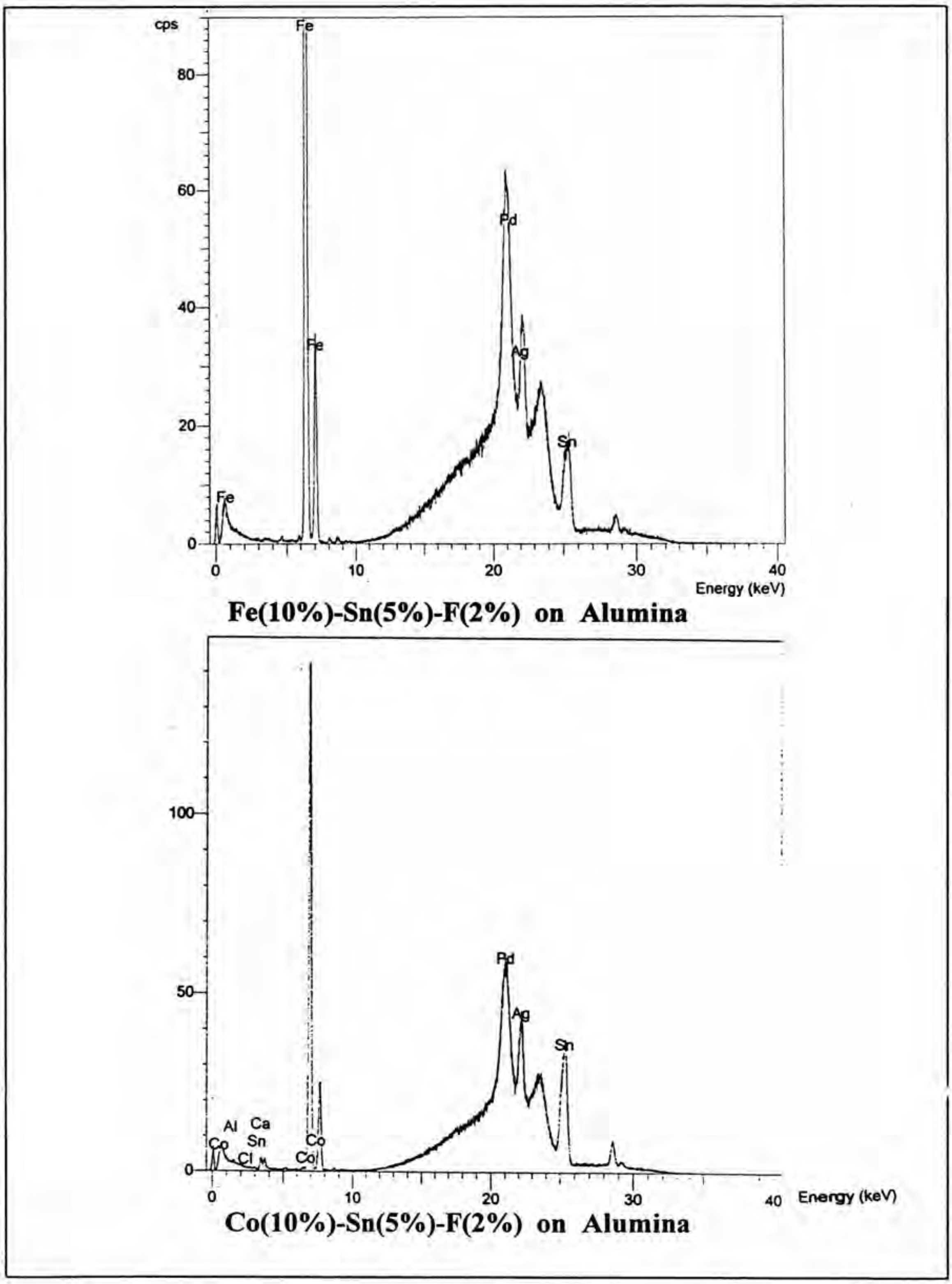
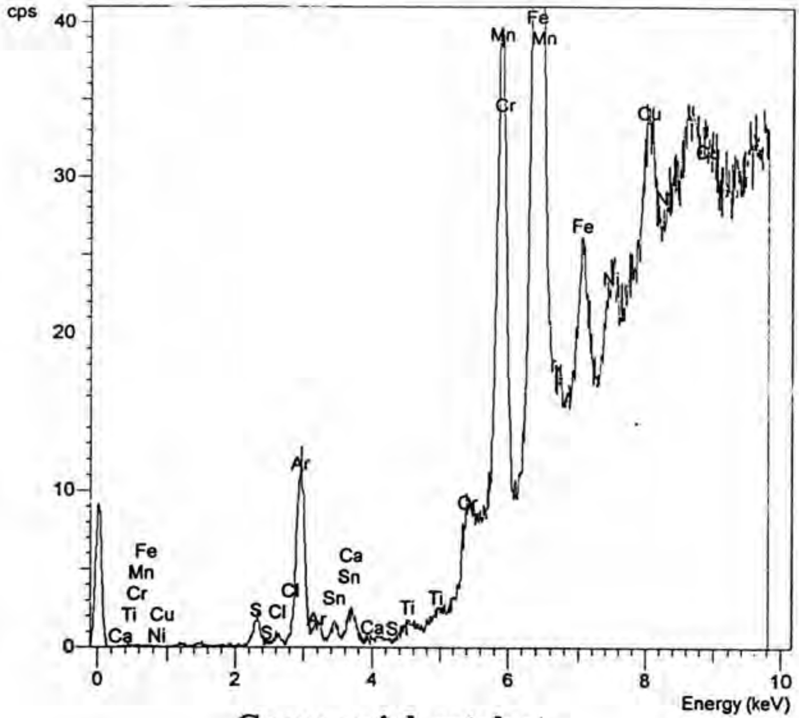
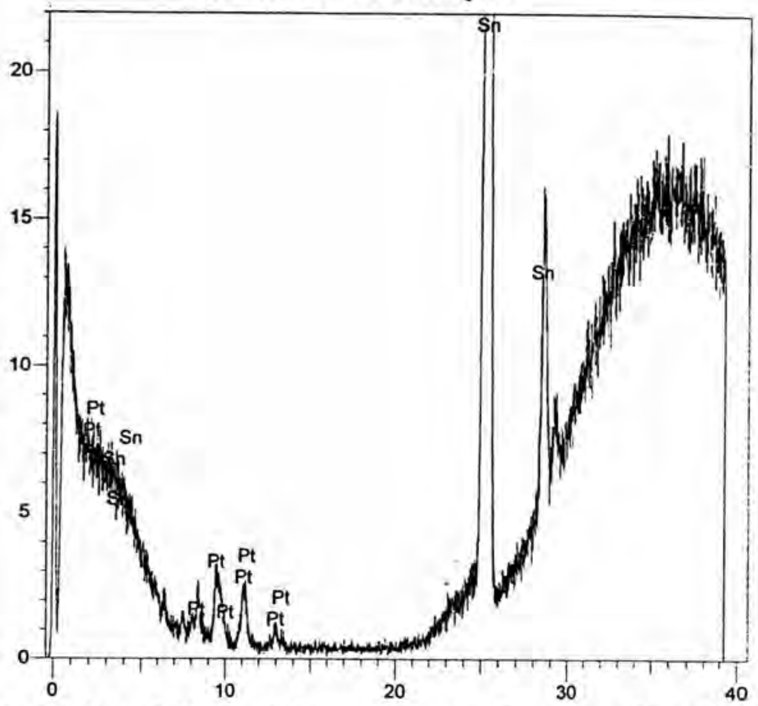


Figure A2 Plots of X-ray fluorescence data of alumina and catalyst type



Commercial catalyst



Commercial catalyst at Very heavy elements Condition

Figure A3 Plots of X-ray fluorescence data of commercial catalyst

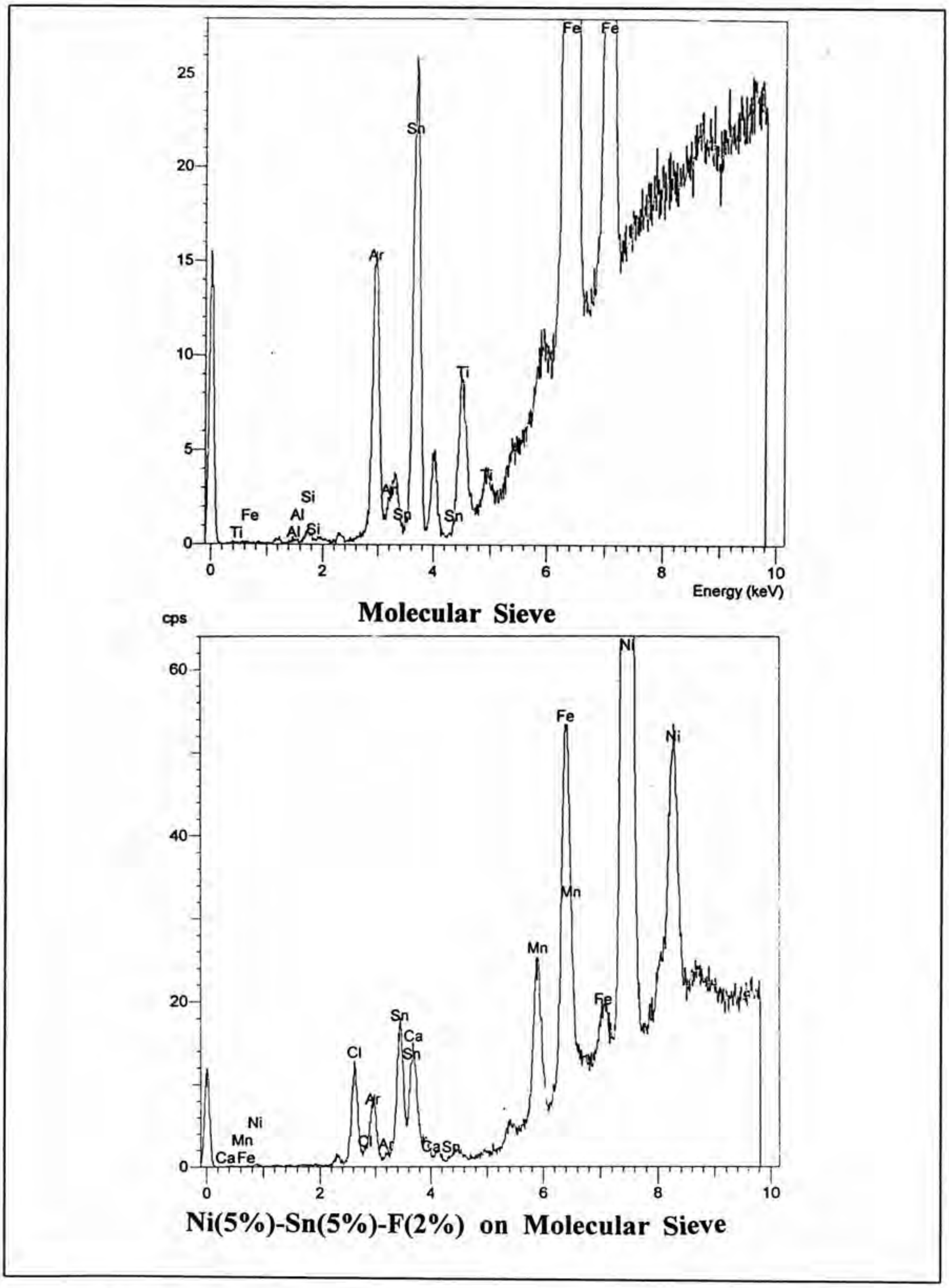
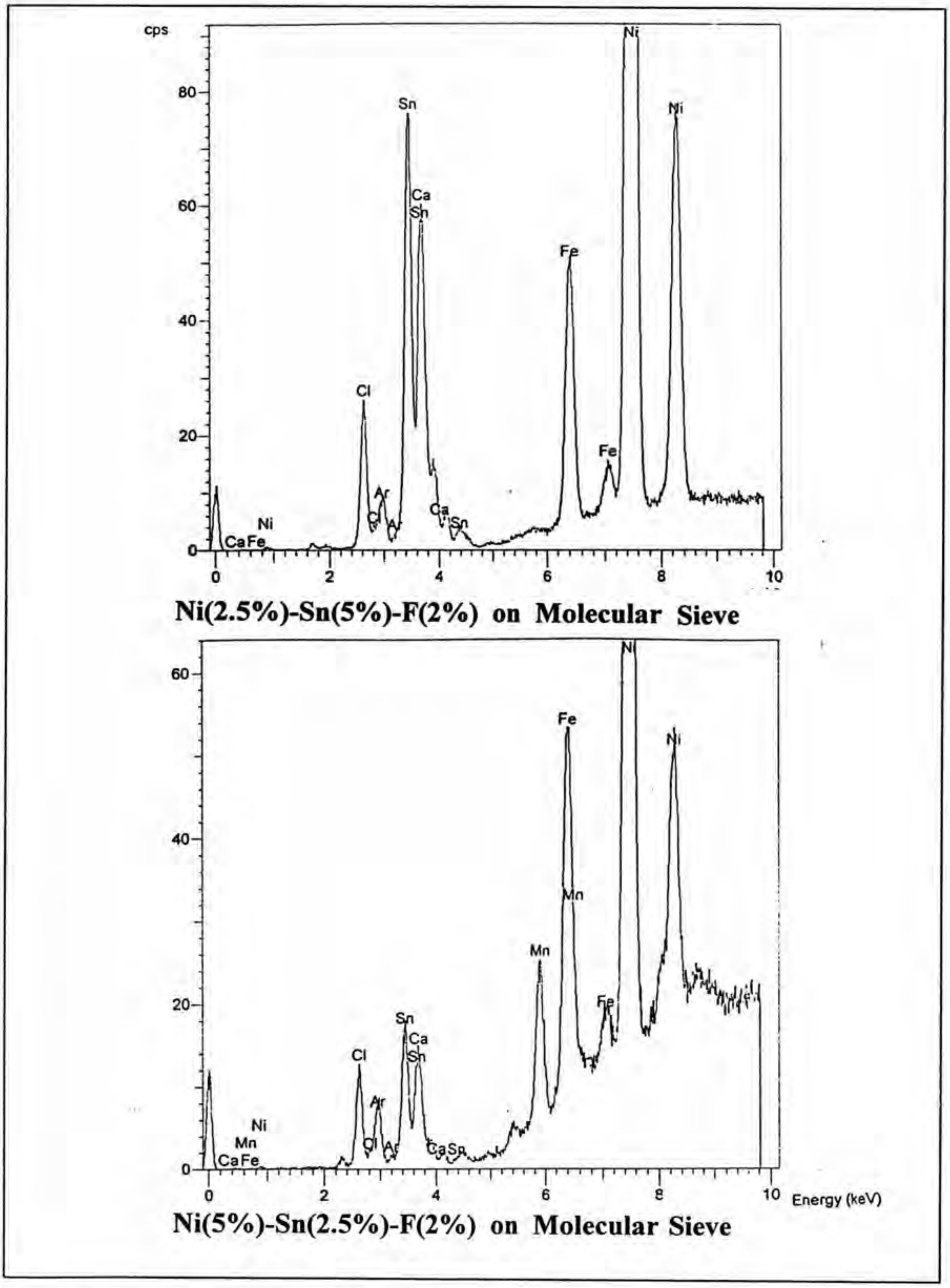


Figure A4 Plots of X-ray fluorescence data of molecular sieve and catalyst type



Ni(2.5%)-Sn(5%)-F(2%) on Molecular Sieve

Ni(5%)-Sn(2.5%)-F(2%) on Molecular Sieve

Figure A5 Plot of X-ray fluorescence data of molecular sieve and catalyst type

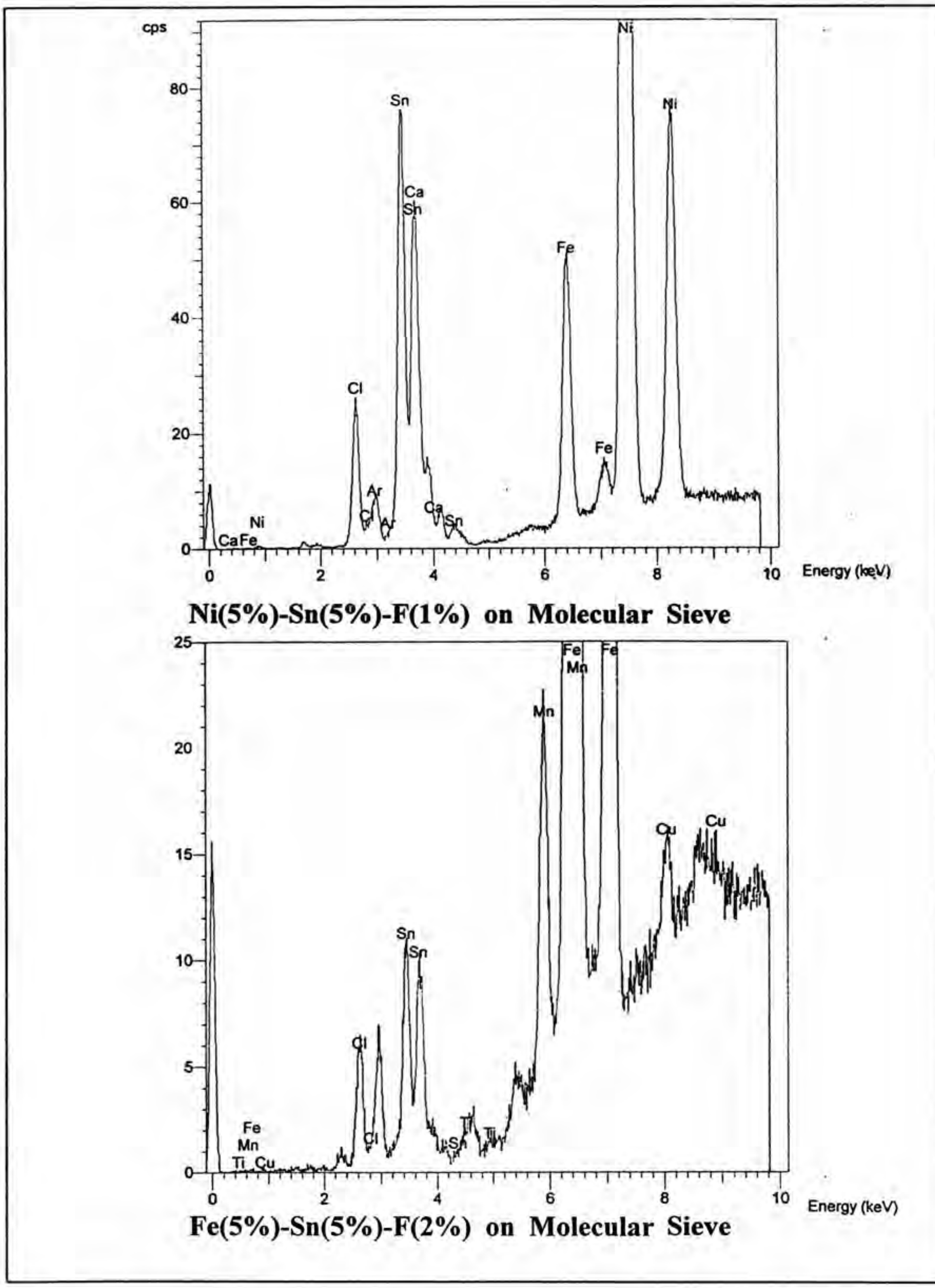
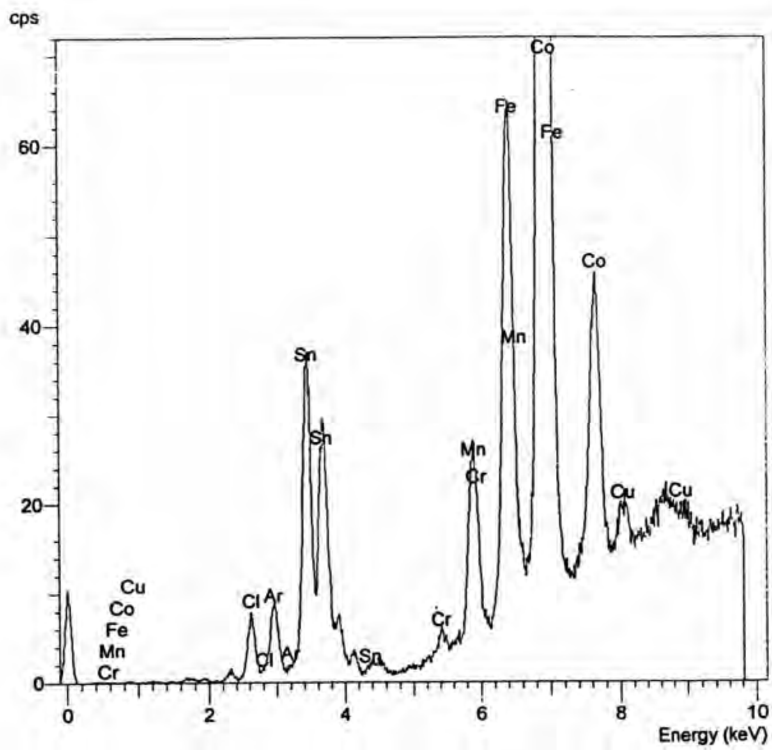


Figure A6 Plot of X-ray fluorescence data of molecular sieve and catalyst type



Co(5%)-Sn(5%)-F(2%) on Molecular Sieve

Figure A7 Plot of X-ray fluorescence data of molecular sieve and catalyst type

Table B1 Composition of oil product from hydrocracking over commercial catalyst and alumina catalyst as functions of reaction times and catalyst concentrations

Peak No.	MW.	No. of carbon	Retention time					
			Com. catalyst	Ni 6hr., 25%wt.	Ni 8hr., 30%wt.	Ni 10hr, 35%wt.	Fe 6hr., 25%wt.	Fe 8 hr., 30%wt.
1	114	C_8	3.50	3.50	3.59	1.97	3.57	1.96
2	128	C_9	4.55	4.60	4.60	2.50	4.40	2.58
3	128	C_9	5.18	5.78	5.78	3.20	5.66	3.20
4	142	C_{10}	5.73	-	-	-	-	-
5	140	C_{10}	6.06	-	-	-	-	-
6	142	C_{10}	-	8.14	8.11	4.68	8.10	4.70
7	142	C_{10}	-	8.54	8.52	4.99	8.51	5.00
8	142	C_{10}	-	9.97	9.94	6.30	10.27	6.25
9	156	C_{11}	12.62	12.82	13.01	8.43	12.65	8.27
10	170	C_{12}	12.89	13.02	13.33	8.64	12.93	8.51
11	170	C_{12}	16.06	15.89	16.04	11.58	16.20	11.31
12	184	C_{13}	-	17.74	17.53	12.42	17.46	12.39
13	184	C_{13}	18.34	18.70	18.01	13.94	18.52	13.90
14	198	C_{14}	-	-	-	-	-	-
15	198	C_{14}	-	-	-	-	-	19.81
16	184	C_{13}	23.60	-	-	19.87	-	20.08
17	212	C_{15}	24.25	-	-	-	-	-
18	212	C_{15}	-	-	-	-	-	-
19	216	C_{16}	-	-	-	-	-	-
20	128	C_9	-	4.70	4.88	2.71	4.59	2.70
21	140	C_{10}	-	7.03	7.01	3.97	6.97	3.95

Table B2 Composition of oil product from hydrocracking over commercial catalyst and alumina catalyst as functions of reaction times and catalyst concentrations

Peak No.	MW.	No. of carbon	Retention time					
			Fe 10hr, 35%wt.	Fe 12hr, 40%wt.	Co 6hr., 25%wt.	Co 8hr., 30%wt.	Co 10hr, 35%wt.	Co 12hr, 40%wt.
1	114	C_8	3.58	3.56	3.58	3.56	3.57	3.57
2	128	C_9	4.51	4.30	4.58	4.66	4.58	4.70
3	128	C_9	5.42	5.93	5.81	5.76	5.95	5.74
4	142	C_{10}	-	-	-	-	-	-
5	140	C_{10}	-	-	-	-	-	-
6	142	C_{10}	8.10	8.08	8.12	8.14	8.08	8.29
7	142	C_{10}	8.50	8.49	8.53	8.65	8.71	8.51
8	142	C_{10}	10.39	10.06	10.06	10.08	1016	10.10
9	156	C_{11}	12.64	12.65	12.71	12.43	12.33	12.83
10	170	C_{12}	12.92	12.93	12.93	12.84	12.61	13.04
11	170	C_{12}	16.03	16.34	15.94	15.80	15.70	16.06
12	184	C_{13}	17.38	17.56	17.49	17.54	17.62	17.42
13	184	C_{13}	18.98	19.22	18.48	18.53	18.64	18.46
14	198	C_{14}	-	-	-	-	-	-
15	198	C_{14}	-	-	-	-	-	-
16	184	C_{13}	-	-	-	-	-	-
17	212	C_{15}	-	-	-	-	-	-
18	212	C_{15}	-	-	-	-	-	-
19	216	C_{16}	-	-	-	-	-	-
20	128	C_9	4.68	4.51	4.70	4.85	4.67	4.84
21	140	C_{10}	6.93	6.89	6.95	6.96	6.92	6.97

Table B3 Composition of oil product from hydrocracking over molecular sieve catalsyt as functions of catalyst types and element compositions

Peak No.	MW.	No. of carbon	Retention time					
			Ni 5-5-2	Ni2.5-5-2	Ni5-2.5-2	Ni5-5-1	Fe 5-5-2	Co 5-5-2
1	114	C_8	2.00	3.48	3.36	3.68	2.10	3.47
2	128	C_9	2.61	4.52	4.51	4.75	2.75	4.52
3	128	C_9	3.31	5.22	5.44	5.21	3.35	5.46
4	142	C_{10}	3.49	5.40	5.65	5.63	-	5.90
5	140	C_{10}	3.68	6.03	6.32	6.30	3.65	6.32
6	142	C_{10}	4.83	7.57	7.56	8.26	-	8.04
7	142	C_{10}	5.12	8.02	-	8.66	5.07	8.44
8	142	C_{10}	6.19	9.72	-	9.79	-	9.84
9	156	C_{11}	8.43	12.57	12.57	12.89	8.40	12.49
10	170	C_{12}	8.67	12.83	12.84	13.13	8.67	12.87
11	170	C_{12}	11.41	15.95	15.95	16.47	11.39	15.39
12	184	C_{13}	12.29	16.10	-	17.64	12.18	16.61
13	184	C_{13}	13.89	12.87	-	-	13.89	-
14	198	C_{14}	19.52	22.13	22.98	-	19.49	21.55
15	198	C_{14}	19.95	22.95	23.05	-	19.73	22.02
16	184	C_{13}	20.69	23.49	23.93	-	20.91	23.57
17	212	C_{15}	21.25	23.90	24.18	24.71	21.25	24.32
18	212	C_{15}	26.86	28.14	-	-	26.40	-
19	216	C_{16}	29.41	31.44	-	-	-	-
20	128	C_9	-	-	-	-	-	-
21	140	C_{10}	-	-	-	-	-	-

Table B4 Composition of oil product from hydrocracking over Ni(5%)-Sn (5%)-F(2%) and Fe(5%)-Sn(5%)-F(2%) on molecular sieve at various times

Peak No.	MW.	No. of carbon	Ni(5%)-Sn(5%)-F(2%)			Fe(5%)-Sn(5%)-F(2%)	
			3 hr.	5 hr.	12 hr.	3 hr.	5 hr.
1	114	C_8	3.33	3.56	3.55	3.60	3.61
2	128	C_9	4.50	4.66	4.60	4.65	4.58
3	128	C_9	5.38	5.46	5.42	5.36	5.75
4	142	C_{10}	5.67	5.87	5.90	5.78	5.96
5	140	C_{10}	6.76	6.59	6.64	6.40	6.41
6	142	C_{10}	7.58	8.04	8.13	8.11	8.17
7	142	C_{10}	7.80	8.44	8.57	8.31	8.52
8	142	C_{10}	9.61	9.41	9.56	9.91	9.77
9	156	C_{11}	12.60	12.18	12.23	12.59	12.72
10	170	C_{12}	12.92	12.87	12.98	12.97	13.00
11	170	C_{12}	15.93	16.15	16.24	15.83	16.07
12	184	C_{13}	16.25	17.68	17.88	-	17.45
13	184	C_{13}	-	-	-	-	-
14	198	C_{14}	-	-	-	22.35	22.23
15	198	C_{14}	-	21.76	21.84	22.74	22.97
16	184	C_{13}	23.76	23.52	23.68	23.58	23.87
17	212	C_{15}	24.21	24.41	24.55	24.04	24.79
18	212	C_{15}	-	-	-	29.60	29.76
19	216	C_{16}	-	-	-	-	-
20	128	C_9	-	-	-	-	-
21	140	C_{10}	-	-	-	-	-

Table B5 Composition of oil product from hydrocracking over Ni(5%)-Sn (5%)-F(2%) on molecular sieve as functions of catalyst concentrations , hydrogen pressures and temperatures

Peak No.	MW.	No. of carbon	Catalyst concentration			Pressure (psig)		Temp.
			20%	25%	30%	300	400	330°C
1	114	C_8	3.39	3.40	3.63	6.30	3.39	3.70
2	128	C_9	4.57	4.61	4.89	7.45	4.57	4.87
3	128	C_9	5.02	4.69	5.84	8.32	5.42	5.42
4	142	C_{10}	5.28	4.92	6.13	8.61	5.75	5.76
5	140	C_{10}	6.11	5.98	6.40	9.17	6.10	6.33
6	142	C_{10}	8.22	6.47	8.73	10.98	8.14	8.19
7	142	C_{10}	8.65	7.21	9.06	11.34	8.53	8.97
8	142	C_{10}	10.23	8.41	10.84	12.21	9.59	10.42
9	156	C_{11}	12.73	10.85	13.03	15.09	12.72	13.25
10	170	C_{12}	15.82	11.09	13.64	15.78	13.01	13.53
11	170	C_{12}	16.13	13.86	16.56	18.86	16.11	16.76
12	184	C_{13}	17.50	14.23	17.32	-	17.75	17.23
13	184	C_{13}	18.04	15.65	20.18	-	-	-
14	198	C_{14}	22.38	-	26.25	-	-	26.12
15	198	C_{14}	22.77	20.00	26.67	-	-	16.78
16	184	C_{13}	23.4	20.75	29.50	-	23.67	28.58
17	212	C_{15}	24.54	21.10	30.12	-	24.55	29.06
18	212	C_{15}	-	-	-	-	-	-
19	216	C_{16}	-	-	-	-	-	-
20	128	C_9	-	-	-	-	-	-
21	140	C_{10}	-	-	-	-	-	-

Table B6 Composition of oil product from reused Ni(5%)-Sn(5%)-F(2%)/MS , reproducibility of Ni(5%)-Sn(5%)-F(2%)/MS and reproducibility of Fe(5%)-Sn (5%)-F(2%)/MS

Peak No.	MW.	No. of carbon	Reused Ni catalyst		Repr. of Ni catalyst		Fe
			t_R (min)	t_R (min)	t_R (min)	t_R (min)	t_R (min)
1	114	C_8	3.63	3.65	3.45	3.59	3.52
2	128	C_9	4.72	4.73	4.72	4.67	4.61
3	128	C_9	5.33	5.54	5.51	5.56	5.32
4	142	C_{10}	5.75	5.85	5.81	5.88	5.50
5	140	C_{10}	6.32	6.48	6.44	6.51	6.40
6	142	C_{10}	7.70	8.22	8.17	7.68	8.22
7	142	C_{10}	8.01	8.61	8.56	8.10	8.86
8	142	C_{10}	9.30	10.03	9.84	10.37	10.17
9	156	C_{11}	12.85	12.84	12.73	12.82	12.44
10	170	C_{12}	13.01	13.13	13.01	13.25	12.87
11	170	C_{12}	16.09	16.20	16.09	15.46	15.40
12	184	C_{13}	17.19	16.94	17.19	16.00	17.12
13	184	C_{13}	22.54	18.32	-	-	-
14	198	C_{14}	-	22.33	-	-	-
15	198	C_{14}	24.01	-	22.54	-	22.17
16	184	C_{13}	24.48	24.17	23.97	24.10	22.68
17	212	C_{15}	-	24.61	24.48	24.57	24.01
18	212	C_{15}	-	-	-	-	24.26
19	216	C_{16}	-	-	-	-	-
20	128	C_9	-	-	-	-	-
21	140	C_{10}	-	-	-	-	-

Repr. = Reproducibility

Table B7 The molecular weight distributions of oil product from hydrocracking over Alumina catalysts

M.W.	No. of Carbon	% Peak area											
		Com.	Ni 6hr., 25%wt.	Ni 8hr., 30%wt.	Ni10hr., 35%wt.	Fe 6hr., 25%wt.	Fe 8hr., 30%wt.	Fe 10hr., 35%wt.	Fe 12hr., 40%wt.	Co 6hr., 25%wt.	Co 8hr., 30%wt.	Co10hr., 35%wt.	Co12hr., 40%wt.
114	C_8	12	7	16	28	5	14	15	15	8	16	17	18
128	C_9	42	30	38	40	28	34	39	40	29	39	40	39
142	C_{10}	18	21	27	17	17	24	23	26	18	24	25	28
156	C_{11}	3	14	3	5	16	10	6	5	15	5	6	5
170	C_{12}	13	20	8	5	24	14	10	8	22	8	7	6
184	C_{13}	12	8	8	5	10	8	7	6	8	9	5	4

Com. = Commercial catalyst

Table B8 The molecular weight distributions of oil product from hydrocracking over Molecular sieve catalysts

M.W.	No. of Carbon	% Peak area											
		Ni5-5-2 6hr.	Ni5-5-1	Ni5-2.5-2	Ni2.5-5-2	Fe5-5-2	Co5-5-2	Ni5-5-2 3hr.	Ni5-5-2 5hr.	Ni5-5-2 12hr.	Fe5-5-2 3 hr.	Fe5-5-2 5 hr.	20%
114	C_8	17	19	7	14	15	20	8	17	24	10	18	6
128	C_9	35	40	33	30	32	35	28	35	40	25	30	32
142	C_{10}	25	15	24	25	19	20	18	23	20	15	14	22
156	C_{11}	16	8	9	8	24	7	17	7	8	18	17	9
170	C_{12}	4	15	23	16	15	14	17	12	5	18	16	21
184	C_{13}	3	3	4	7	5	4	12	6	3	14	5	10

Table B9 The molecular weight distributions of oil product from hydrocracking over Molecular sieve catalysts

M.W.	No. of Carbon	% Peak area 25%	30%	300 psig	400 psig	330°C	2	3	Ni1	Ni2	Ni3	Fe1	Fe2
114	C_8	10	12	18	16	5	29	28	17	28	25	15	18
128	C_9	33	34	31	35	31	39	38	35	39	37	32	36
142	C_{10}	24	25	26	27	22	17	15	25	18	18	19	13
156	C_{11}	8	8	6	5	12	3	4	16	3	5	24	20
170	C_{12}	17	15	12	11	21	9	10	4	9	10	7	9
184	C_{13}	8	6	7	6	9	3	4	3	3	5	3	4

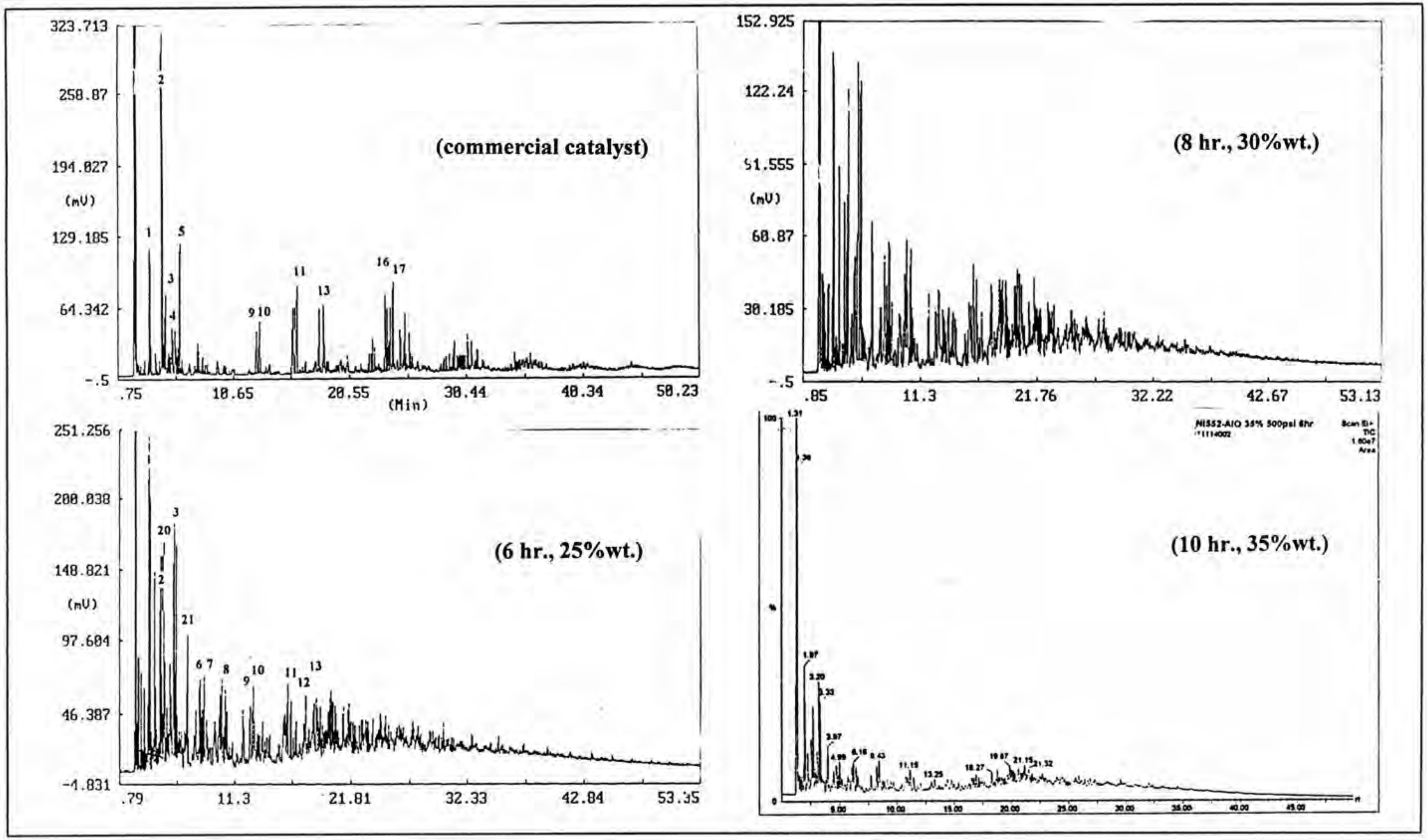


Figure B1 GC chromatograms of oil product from hydrocracking over commercial catalyst and Ni(5%)-Sn(5%)-F(2%) on alumina

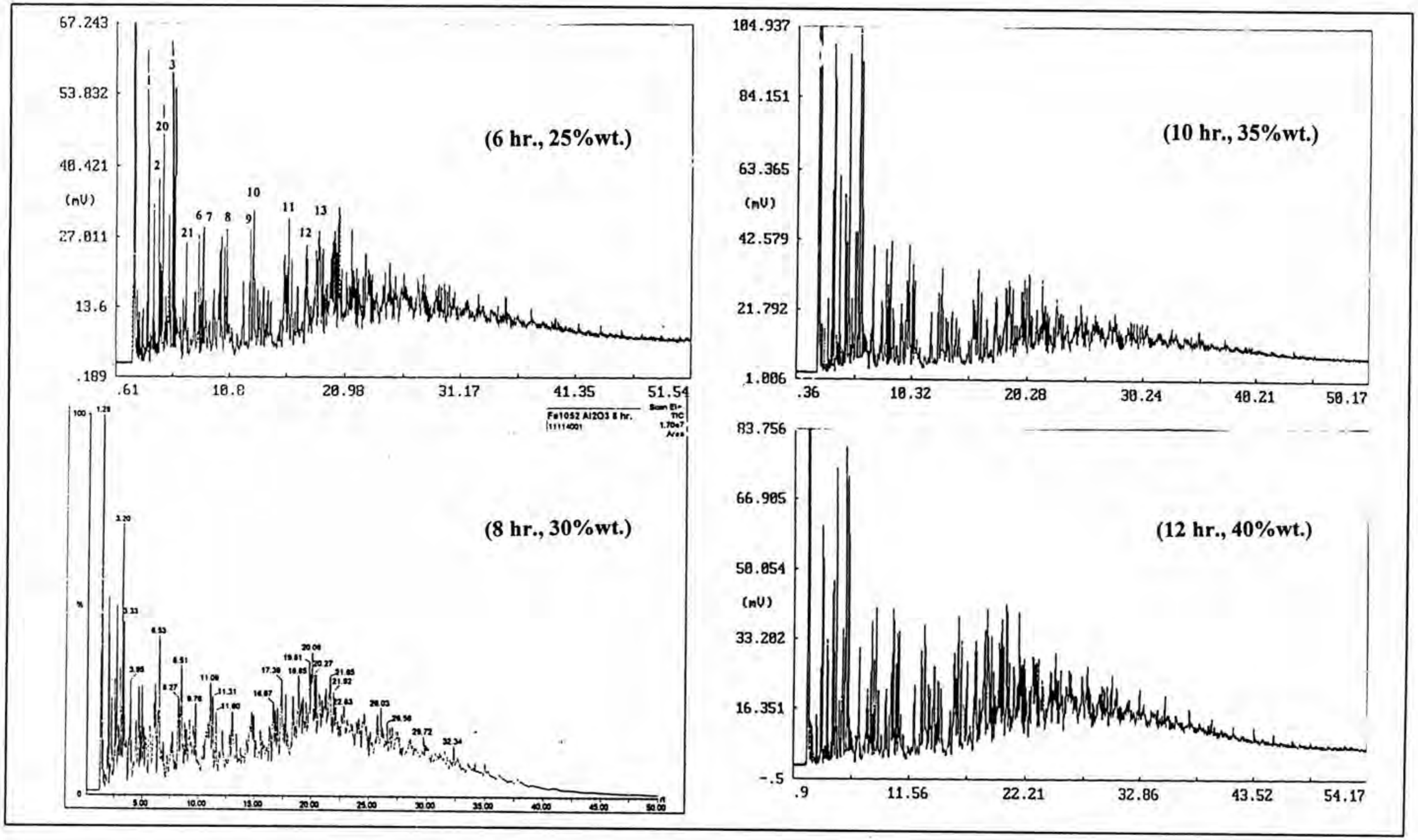


Figure B2 GC chromatograms of oil product from hydrocracking over Fe(10%)-Sn(5%)-F(2%) on alumina

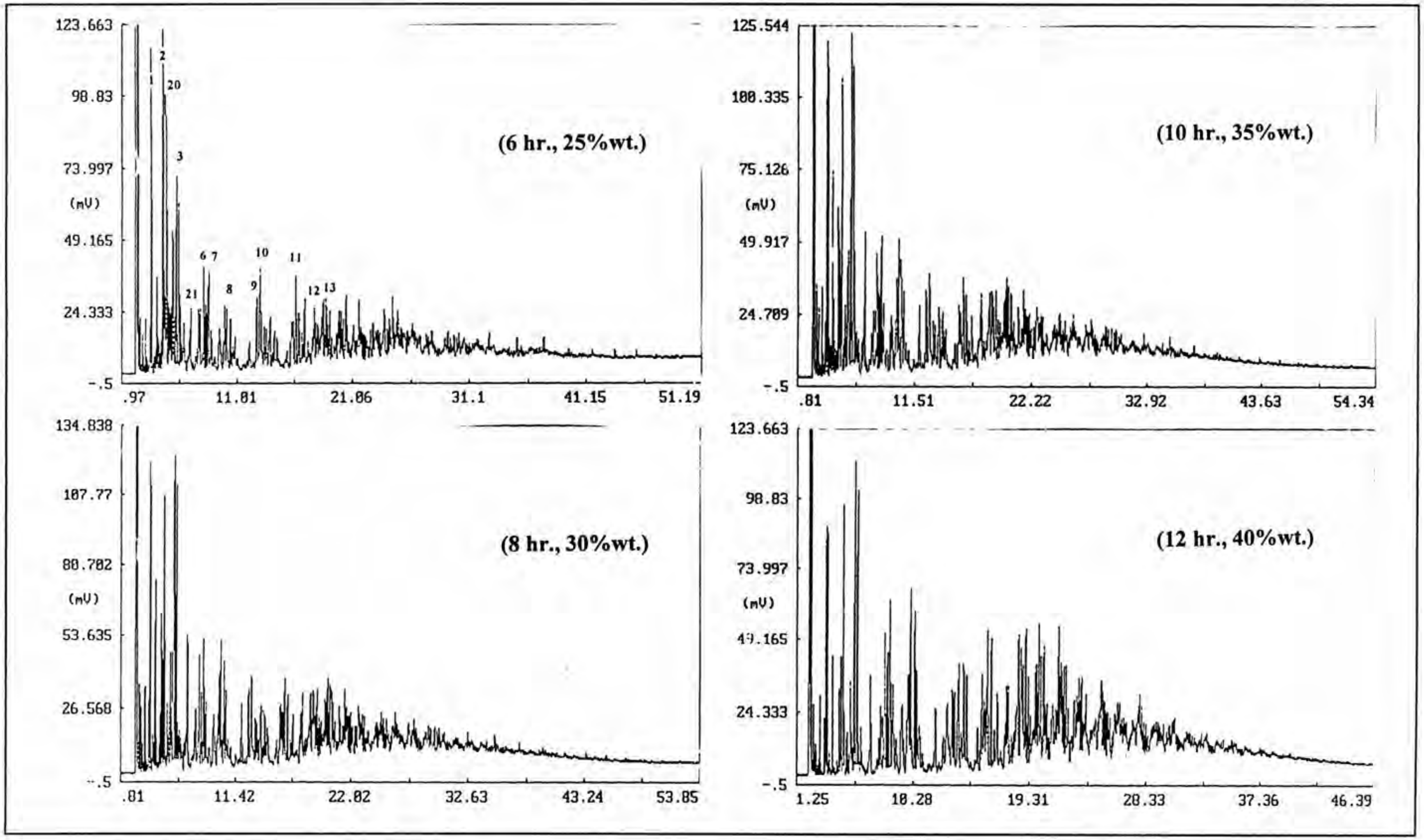


Figure B3 GC chromatograms of oil product from hydrocracking over Co(10%)-Sn(5%)-F(2%) on alumina

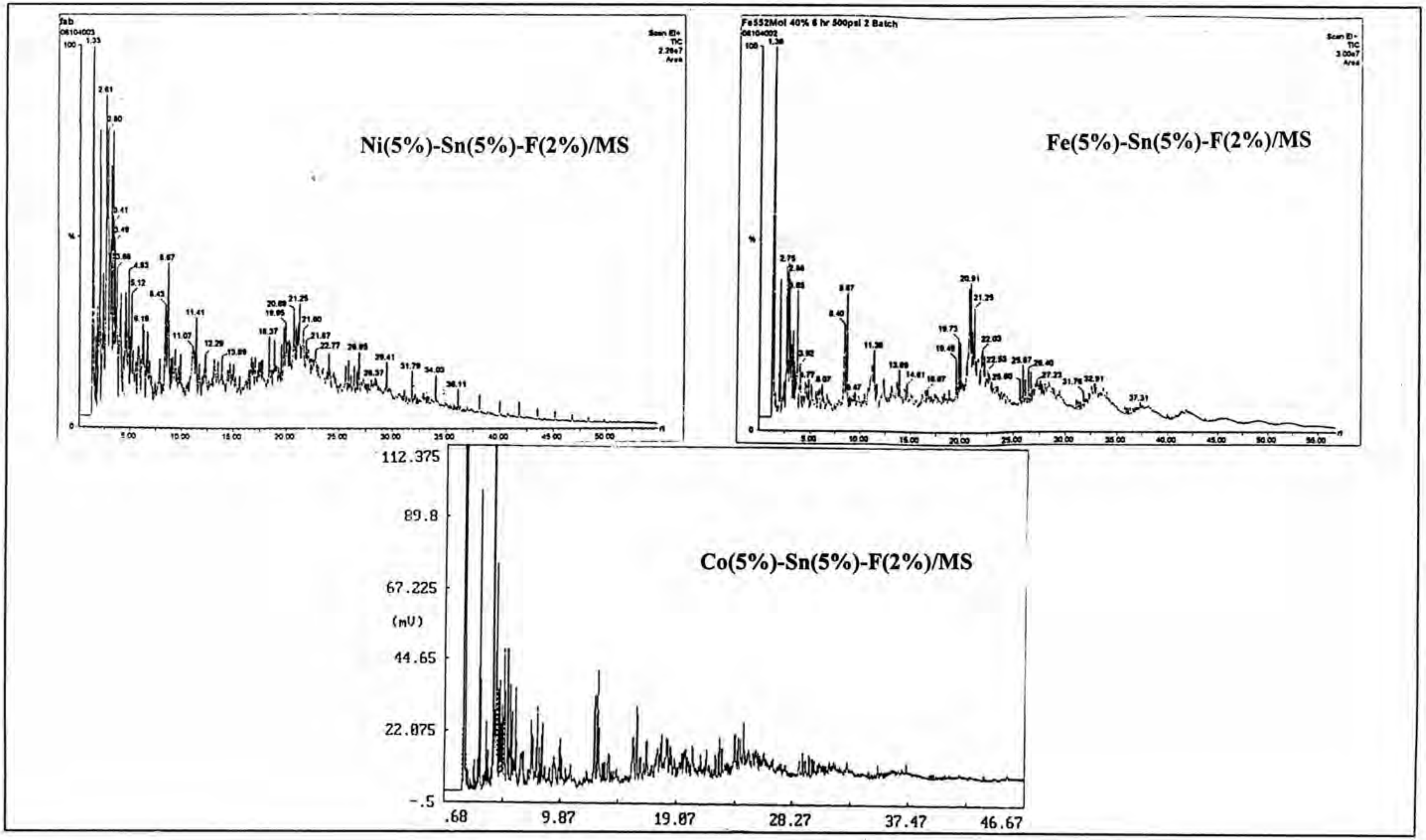


Figure B4 GC chromatograms of oil product from hydrocracking on molecular sieve as a function of catalyst type

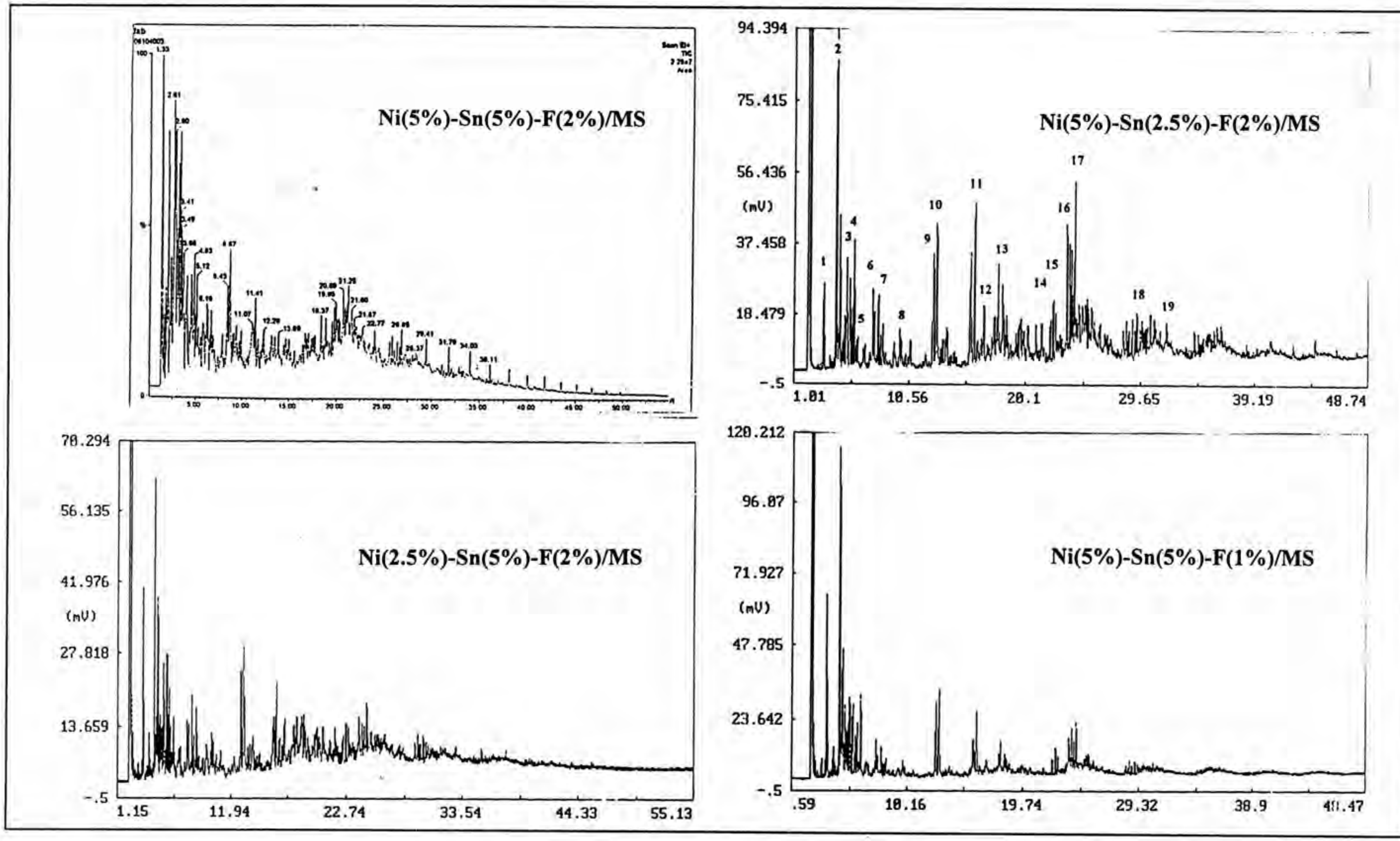


Figure B5 GC chromatograms of oil product from hydrocracking on molecular sieve as a function of element composition

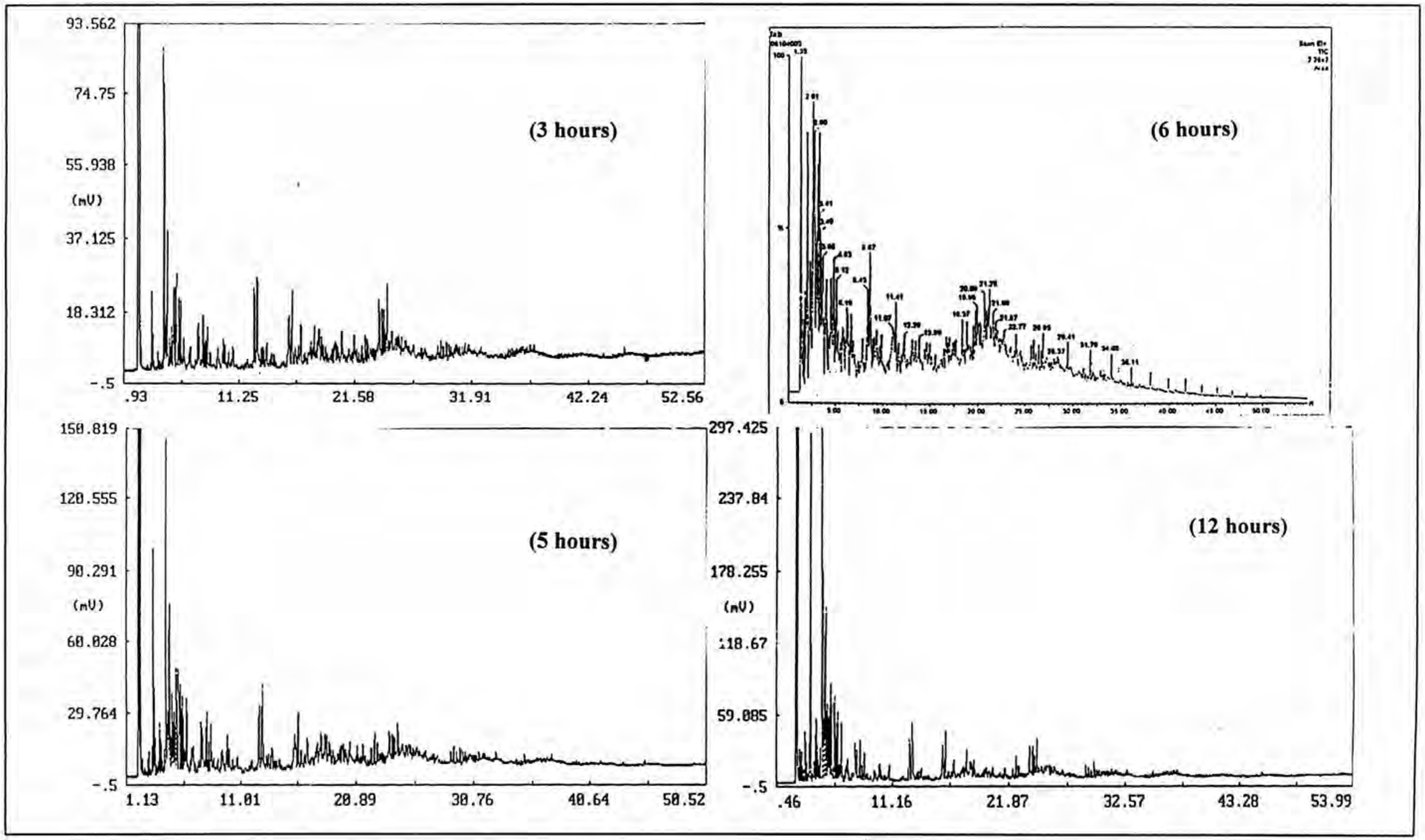


Figure B6 GC chromatograms of oil product from hydrocracking over Ni(5%)-Sn(5%)-F(2%) on molecular sieve as a function of reaction time

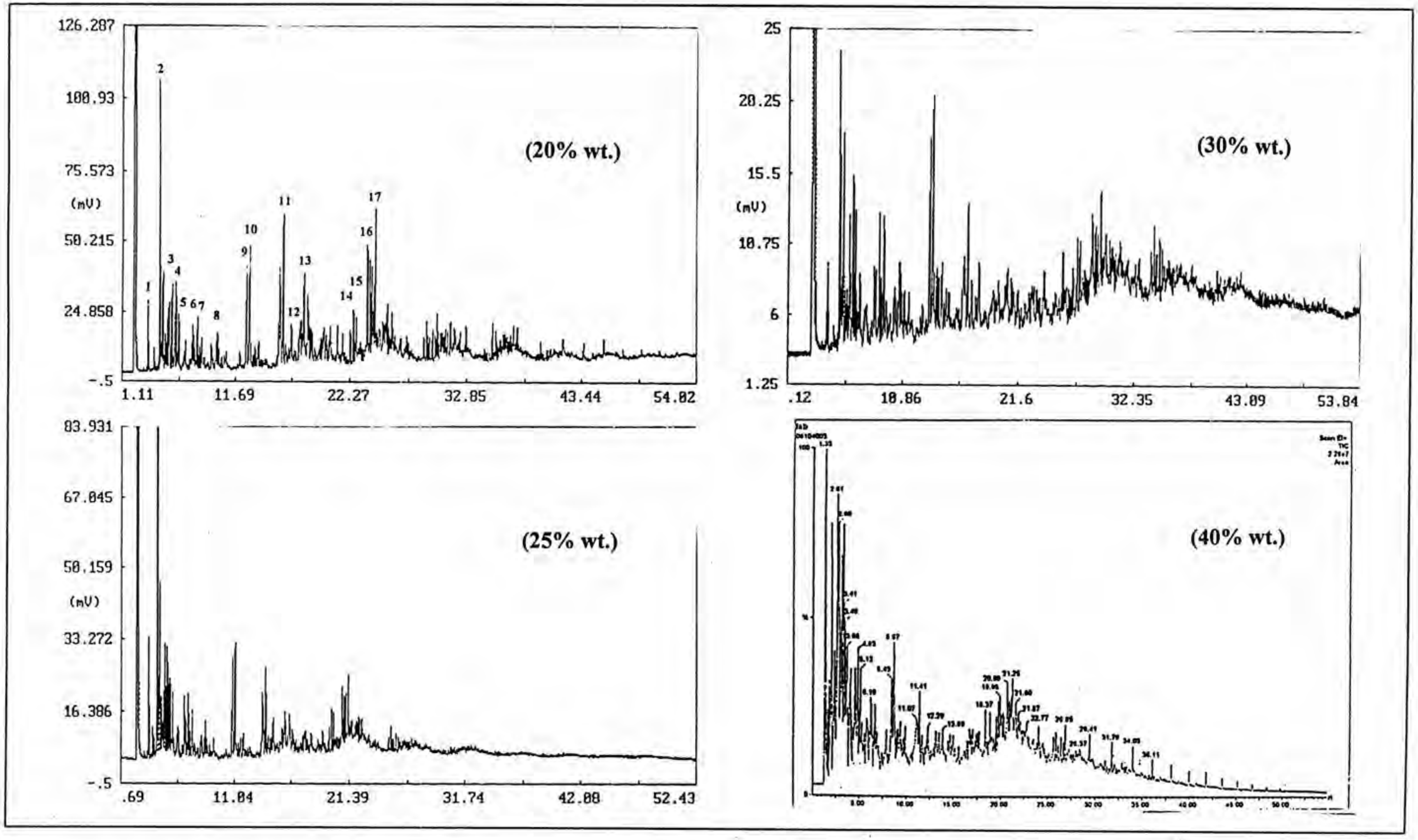


Figure B7 GC chromatog.ams of oil product from hydrocracking over Ni(5%)-Sn(5%)-F(2%) on molecular sieve as a function of catalyst concentration

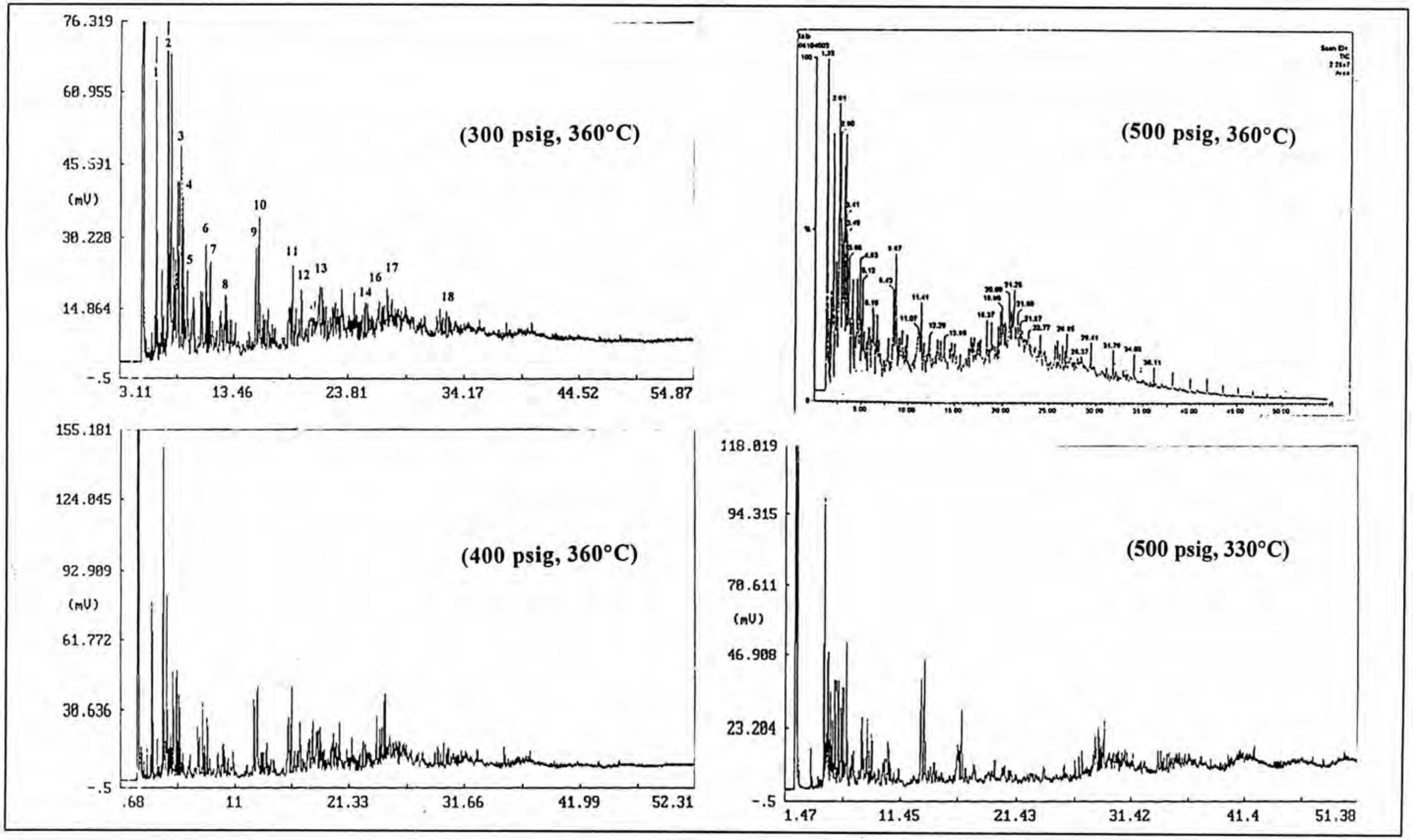


Figure B8 GC chromatograms of oil product from hydrocracking over Ni(5%)-Sn(5%)-F(2%) on molecular sieve as functions of hydrogen pressures and temperatures

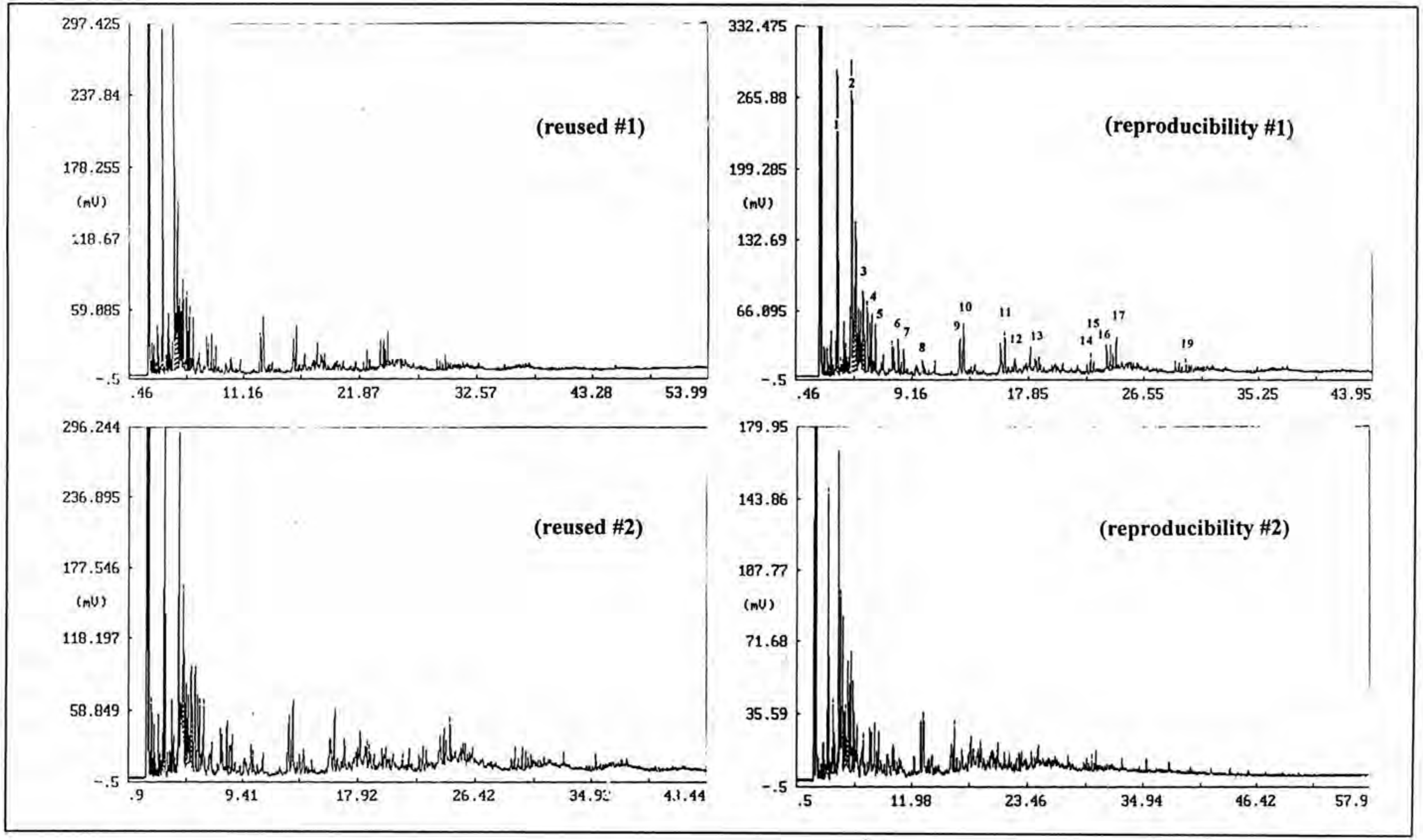


Figure B9 GC chromatograms of oil product from hydrocracking over reused Ni(5%)-Sn(5%)-F(2%) on molecular sieve and GC chromatograms of oil product from study the reproducibility

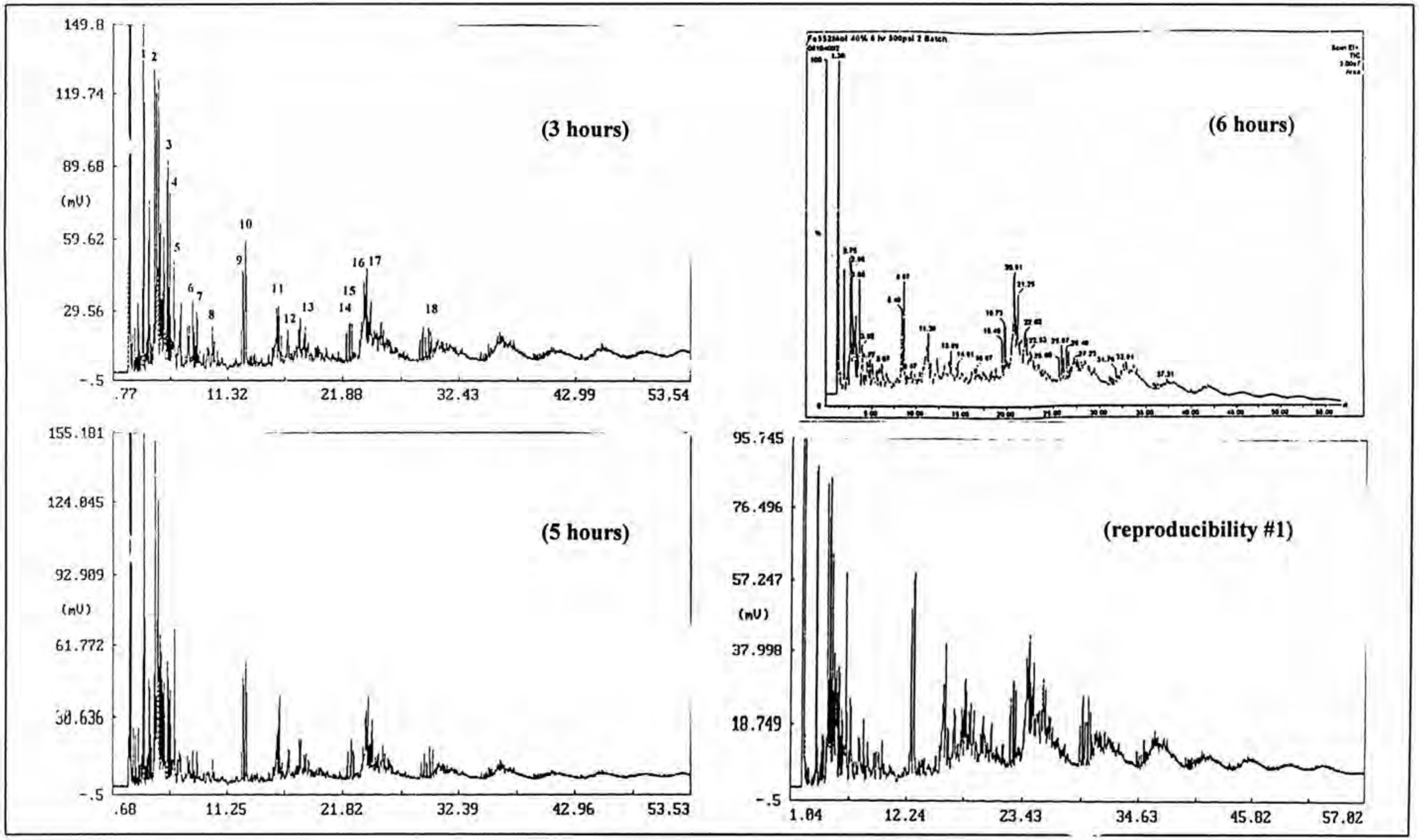
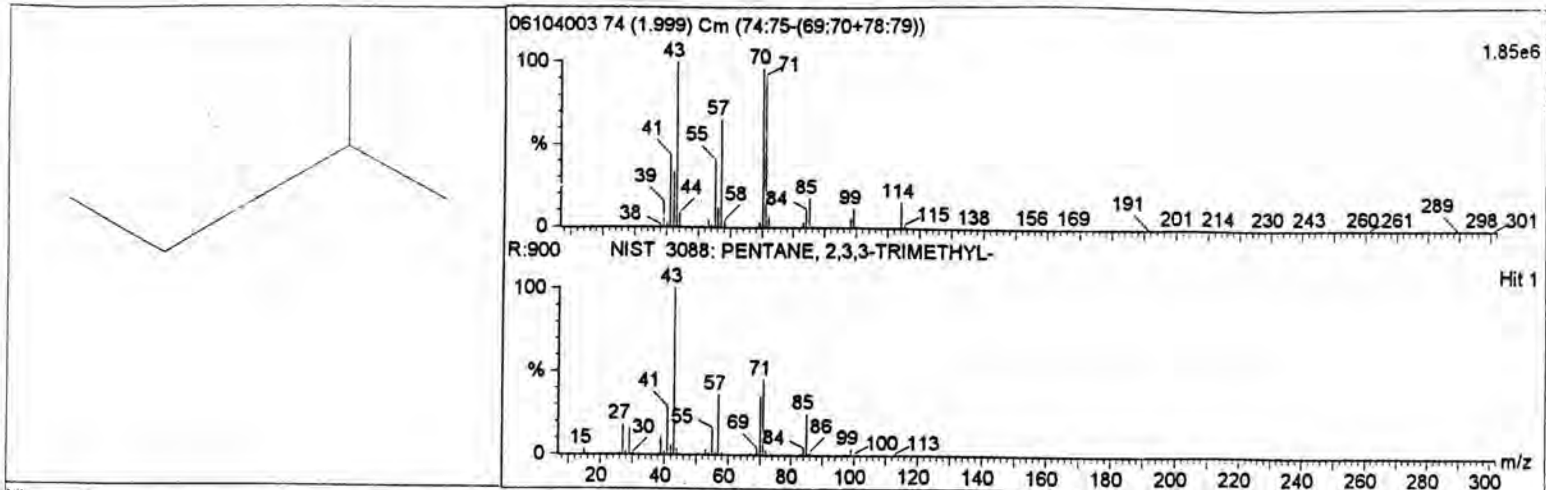
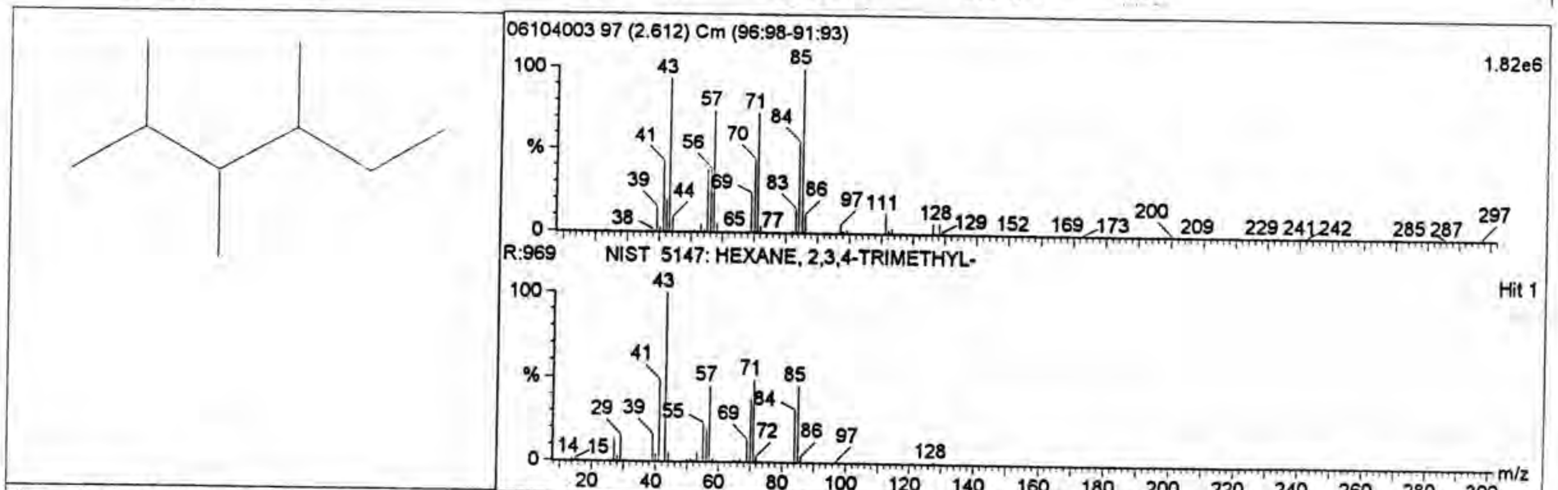


Figure B10 GC chromatograms of oil product from hydrocracking over Fe(5%)-Sn(5%)-F(2%) on molecular sieve at various reaction times and GC chromatogram of oil product from study the reproducibility

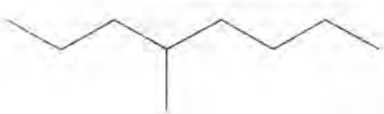


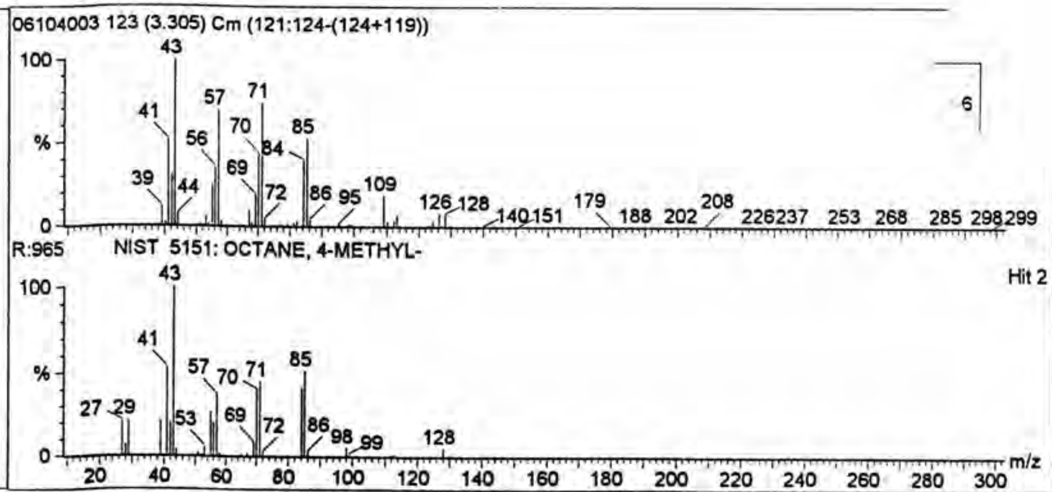
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	PENTANE, 2,3,3-TRIMETHYL-	900	895	1.4	C8H18	560-21-4	NIST
2	HEXANE, 3,3-DIMETHYL-	841	837	114	C8H18	563-16-6	NIST



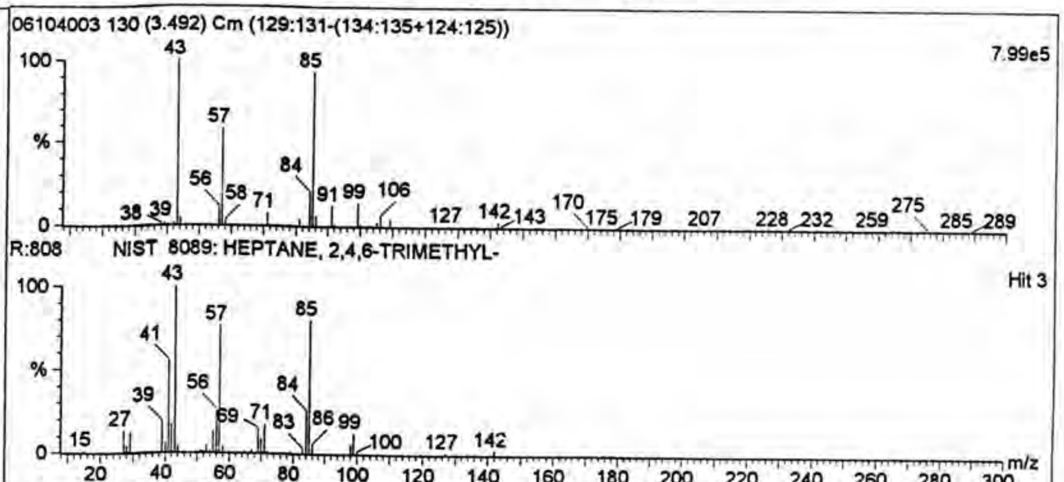
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	HEXANE, 2,3,4-TRIMETHYL-	969	892	128	C9H20	921-47-1	NIST
2	HEXANE, 2,3,5-TRIMETHYL-	930	878	128	C9H20	1069-53-0	NIST

Figure B11 Mass Spectrum of Peak Number 1 and 2



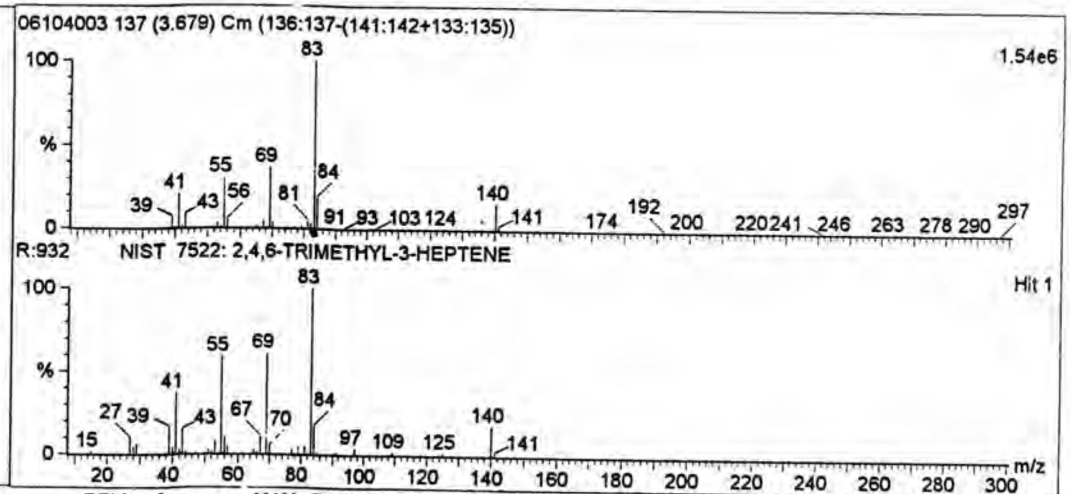


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	HEXANE, 2,3,4-TRIMETHYL-	974	851	128	C9H20	921-47-1	NIST
2	OCTANE, 4-METHYL-	965	850	128	C9H20	2216-34-4	NIST

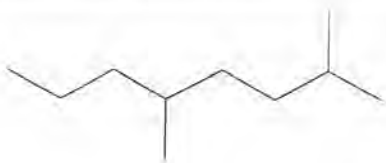


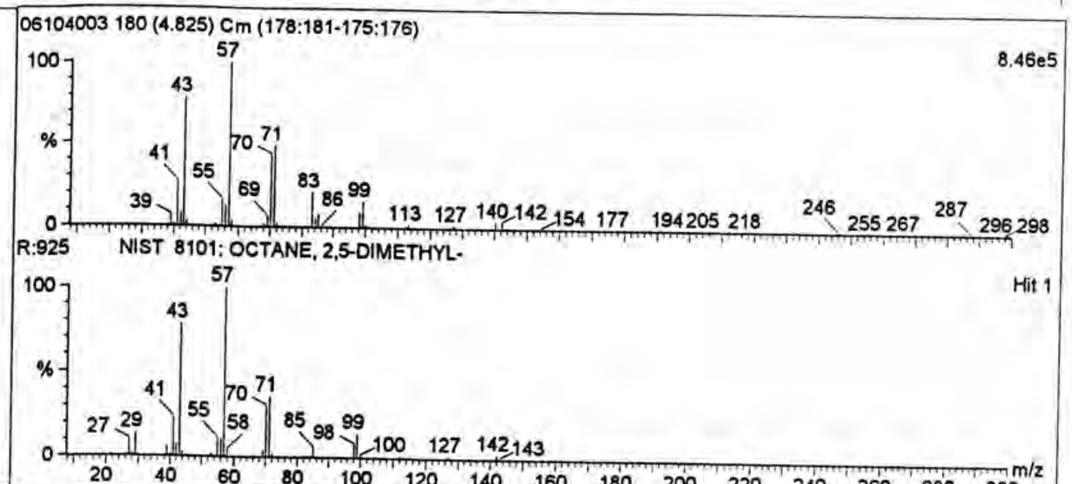
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	UNDECANE, 4,4-DIMETHYL-	835	705	184	C13H28	17312-68-4	NIST
2	4,4-DIMETHYLCYCLOOCTENE	811	683	138	C10H18	0-00-0	NIST

Figure B12 Mass Spectrum of Peak Number 3 and 4



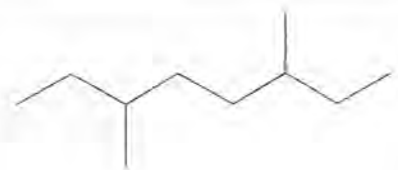
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	2,4,6-TRIMETHYL-3-HEPTENE	932	906	140	C10H20	0-00-0	NIST
2	N-C5H11C(CH3)=C(CH3)2	828	806	140	C10H20	19781-18-1	NIST

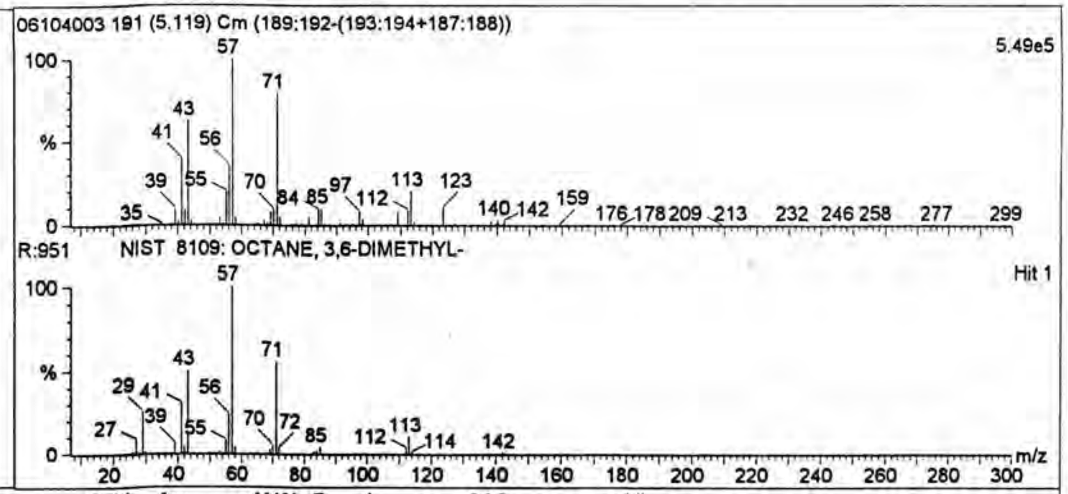




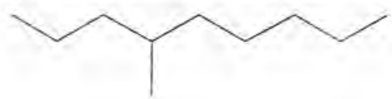
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	OCTANE, 2,5-DIMETHYL-	925	923	142	C10H22	15869-89-3	NIST
2	NONANE, 4-METHYL-	924	897	142	C10H22	17301-94-9	NIST

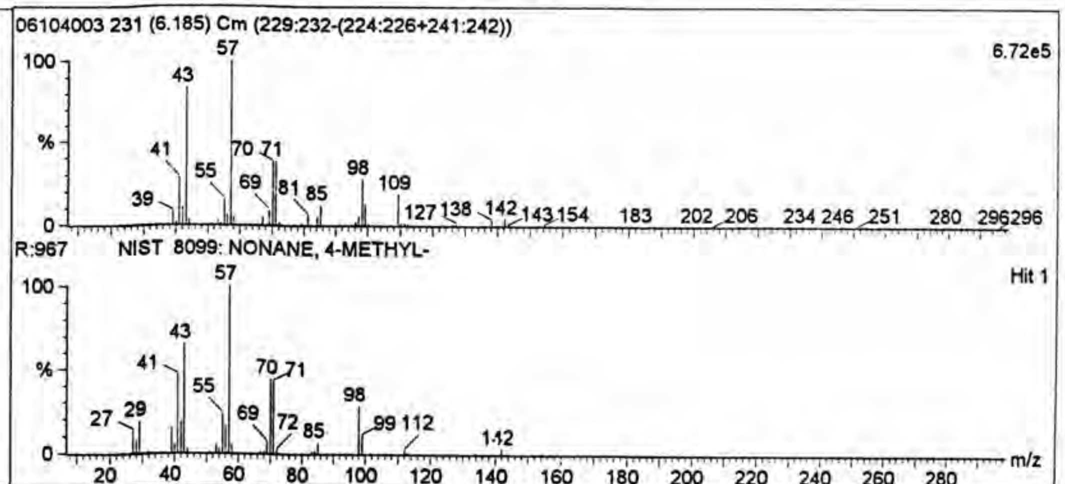
Figure B13 Mass Spectrum of Peak Number 5 and 6





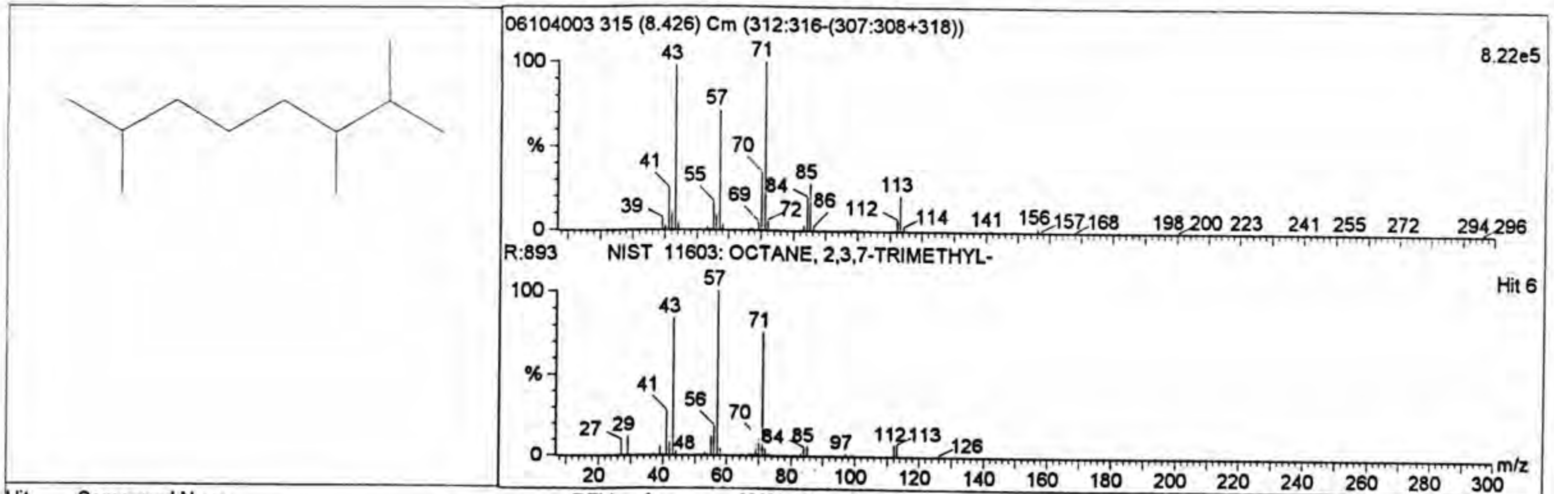
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	OCTANE, 3,6-DIMETHYL-	951	841	142	C10H22	15869-94-0	NIST
2	OCTANE, 2,3,7-TRIMETHYL-	943	863	156	C11H24	62016-34-6	NIST



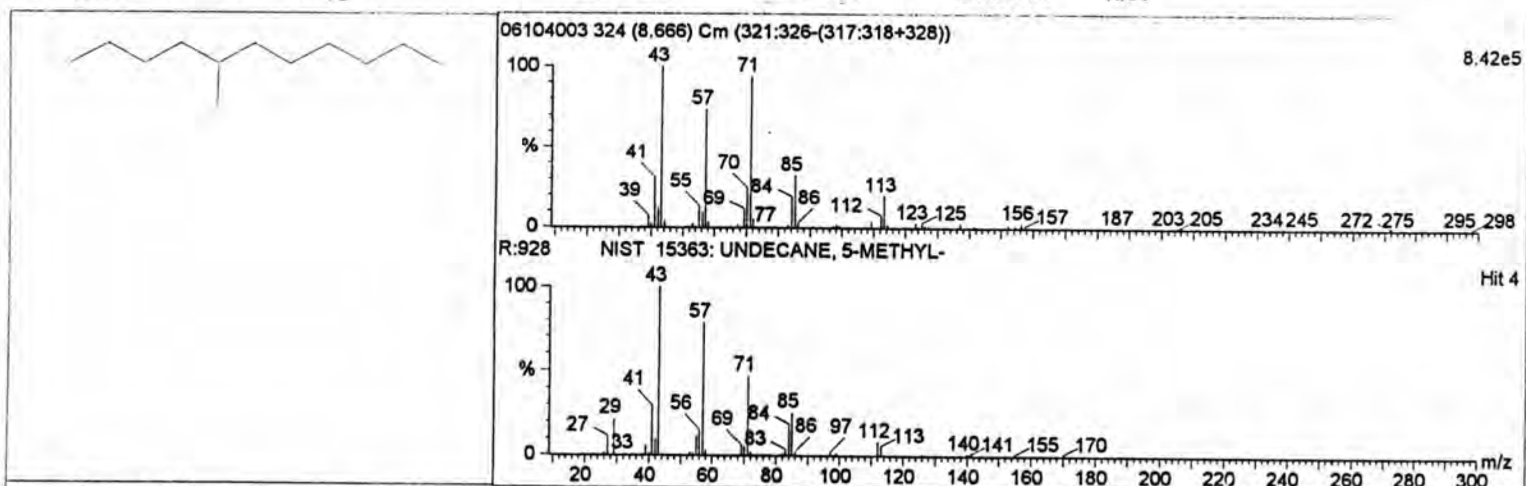


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	NONANE, 4-METHYL-	967	816	142	C10H22	17301-94-9	NIST
2	OCTANE, 2,5-DIMETHYL-	919	827	142	C10H22	15869-89-3	NIST

Figure B14 Mass Spectrum of Peak Number 7 and 8

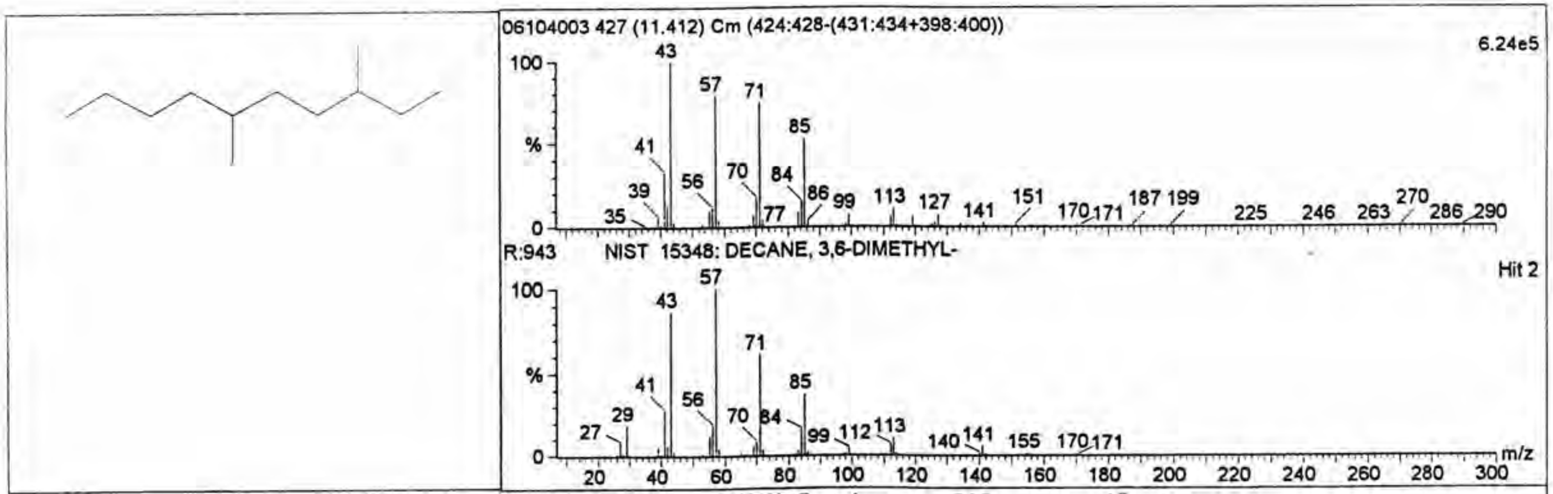


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	DODECANE, 4,6-DIMETHYL-	921	915	198	C14H30	61141-72-8	NIST
2	OCTANE, 2,3,7-TRIMETHYL-	893	878	156	C11H24	62016-34-6	NIST

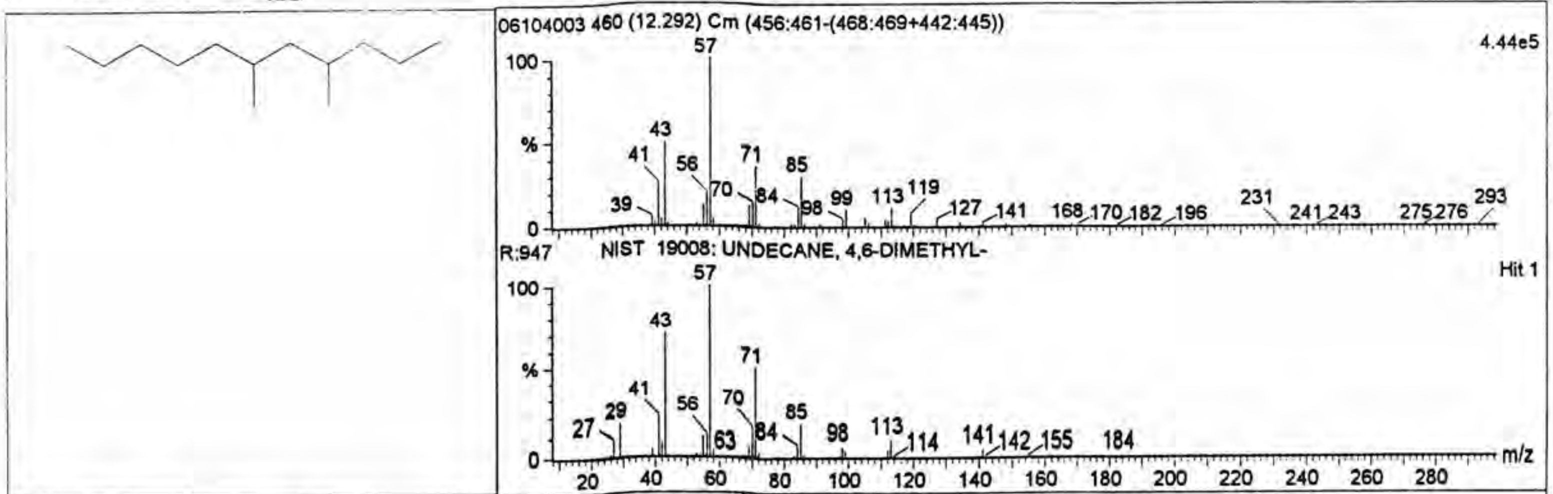


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	3-ETHYL-3-METHYLHEPTANE	946	877	142	C10H22	17302-01-1	NIST
2	DODECANE, 4,6-DIMETHYL-	937	899	198	C14H30	61141-72-8	NIST
3	2,6-DIMETHYLDECANE	935	875	170	C12H26	13150-81-7	NIST
4	UNDECANE, 5-METHYL-	928	872	170	C12H26	1632-70-8	NIST

Figure B15 Mass Spectrum of Peak Number 9 and 10

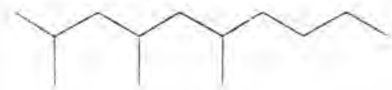


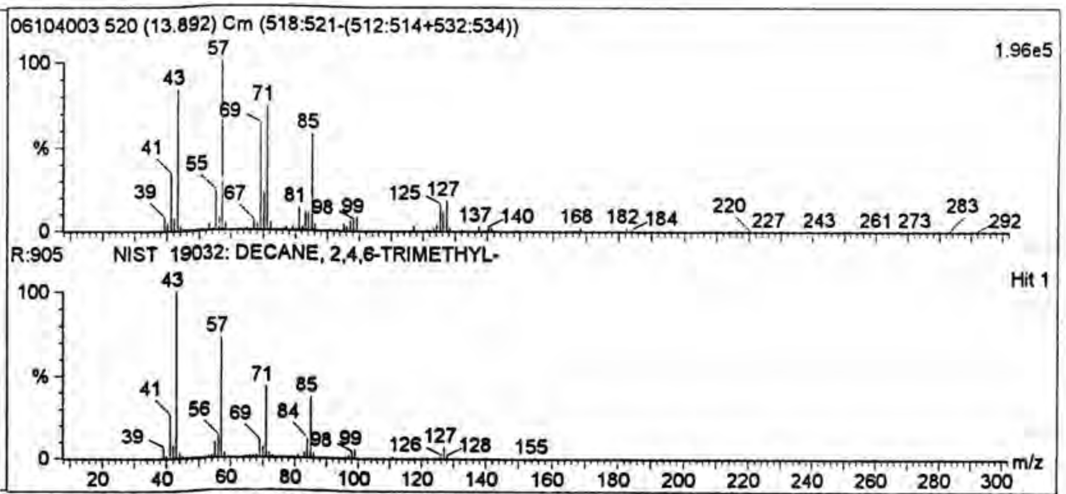
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	UNDECANE, 4,7-DIMETHYL-	950	893	184	C13H28	17301-32-5	NIST
2	DECANE, 3,6-DIMETHYL-	943	897	170	C12H26	17312-53-7	NIST



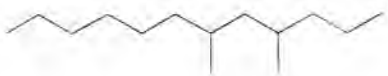
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	UNDECANE, 4,6-DIMETHYL-	947	833	184	C13H28	17312-82-2	NIST
2	DECANE, 2,5,6-TRIMETHYL-	944	814	184	C13H28	62108-23-0	NIST

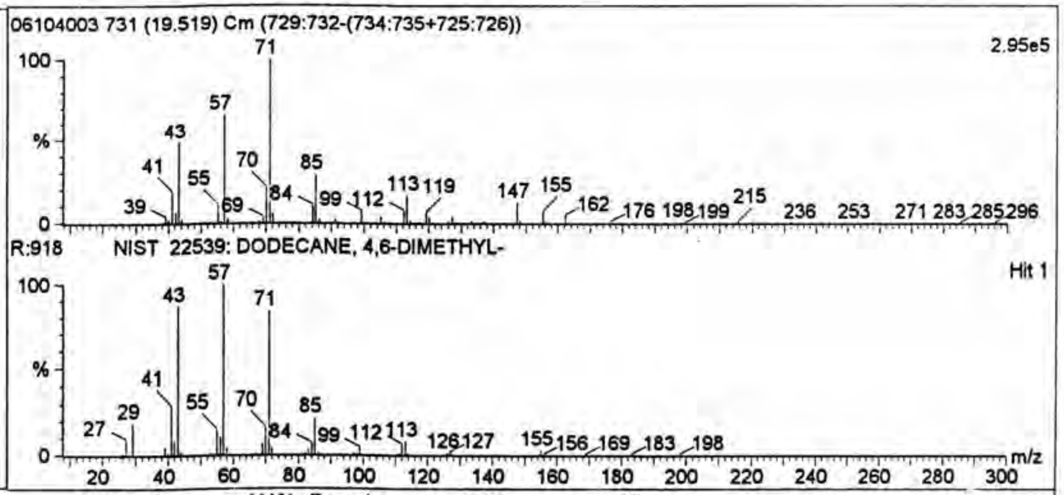
Figure B16 Mass Spectrum of Peak Number 11 and 12





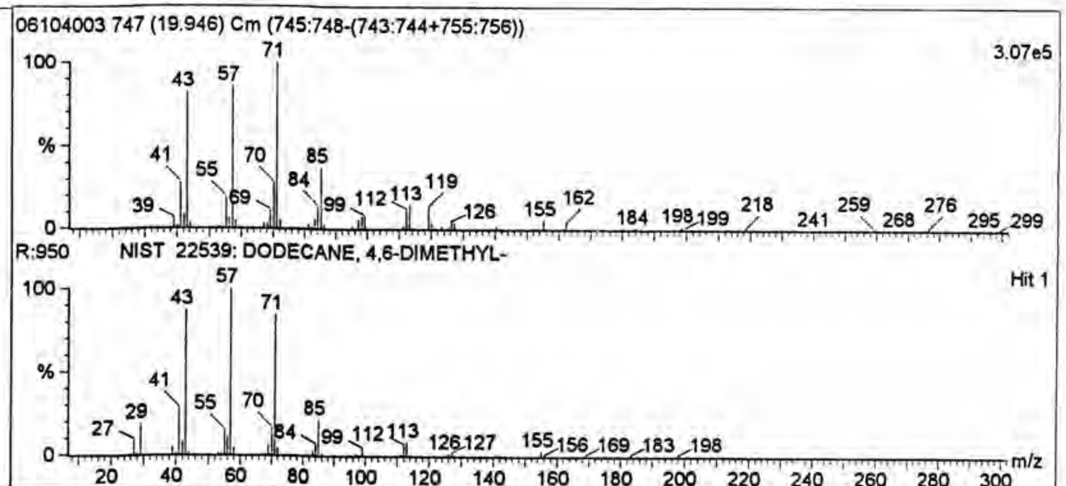
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	DECANE, 2,4,6-TRIMETHYL-	905	808	184	C13H28	62108-27-4	NIST
2	2,3-DIMETHYLDECANE	903	787	170	C12H26	0-00-0	NIST



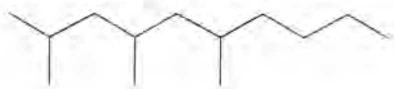


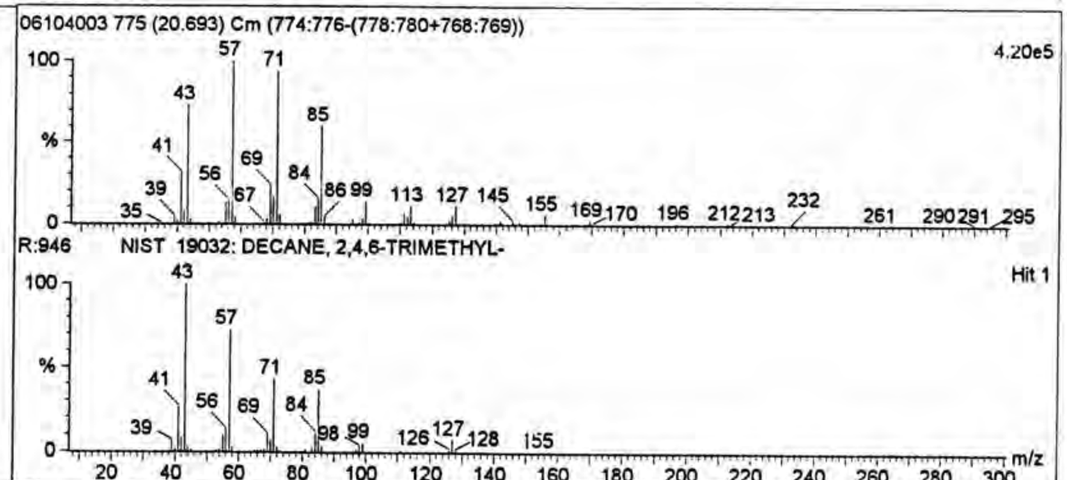
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	DODECANE, 4,6-DIMETHYL-	918	802	198	C14H30	61141-72-8	NIST
2	DECANE, 3,3,6-TRIMETHYL-	911	787	184	C13H28	62338-14-1	NIST

Figure B17 Mass Spectrum of Peak Number 13 and 14



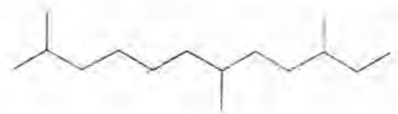
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	DODECANE, 4,6-DIMETHYL-	950	883	198	C14H30	61141-72-8	NIST
2	3-ETHYL-3-METHYLHEPTANE	932	778	142	C10H22	17302-01-1	NIST

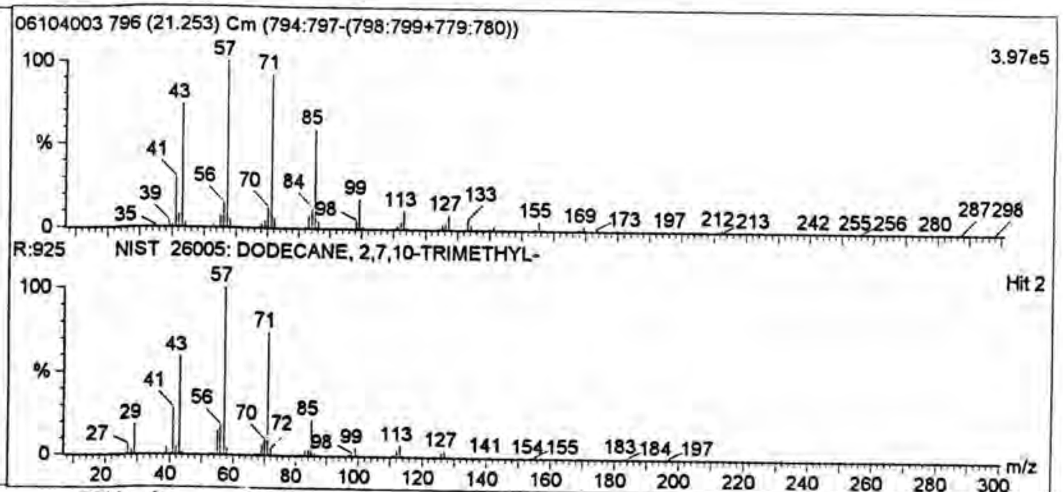




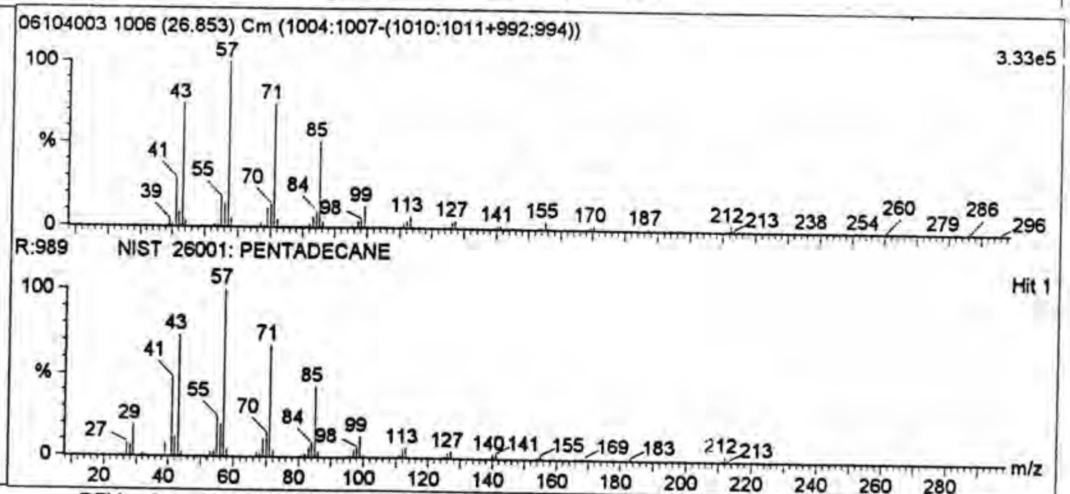
Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	DECANE, 2,4,6-TRIMETHYL-	946	862	184	C13H28	62108-27-4	NIST
2	HENEICOSANE	937	906	296	C21H44	629-94-7	NIST

Figure B18 Mass Spectrum of Peak Number 15 and 16



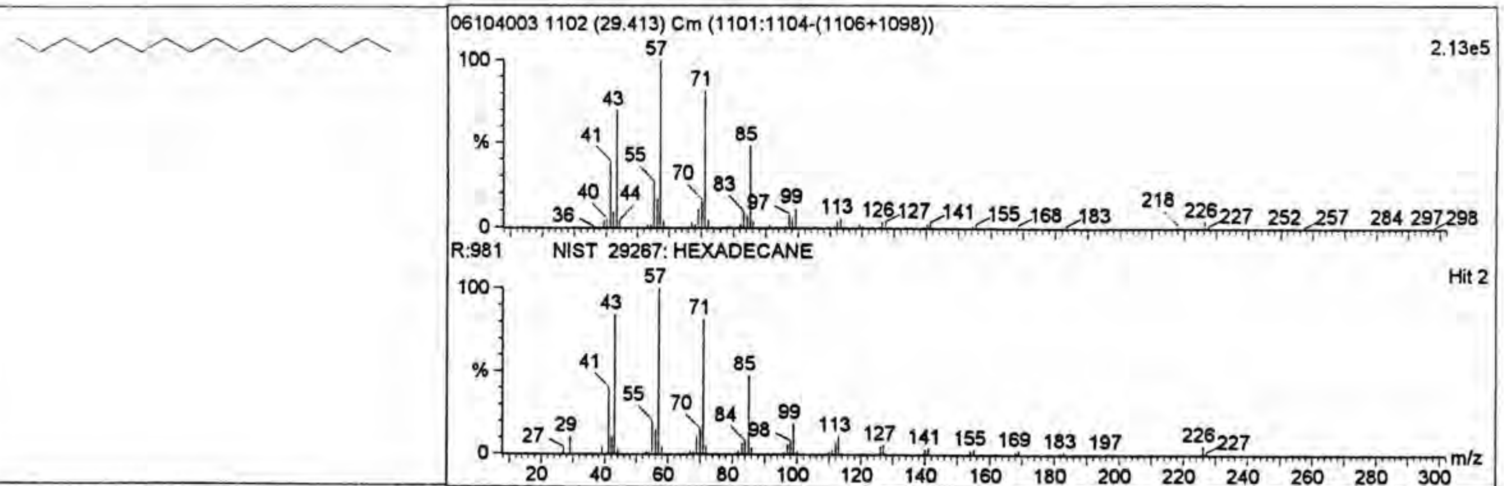


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	HEXADECANE	928	895	226	C16H34	544-76-3	NIST
2	DODECANE, 2,7,10-TRIMETHYL-	925	890	212	C15H32	74645-98-0	NIST

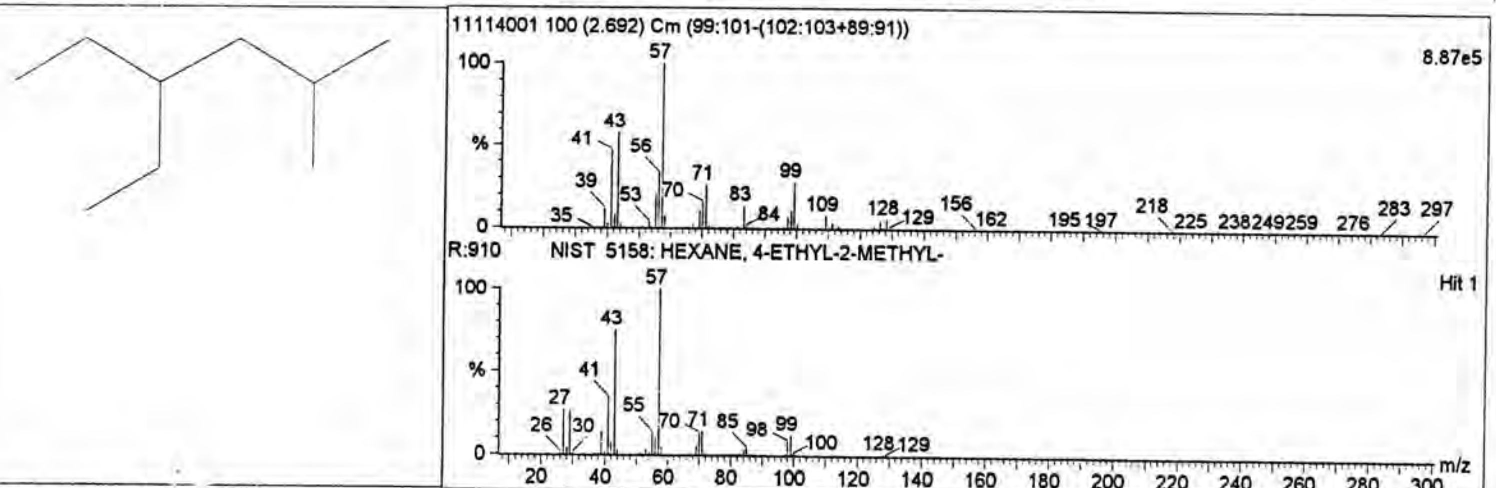


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	PENTADECANE	989	967	212	C15H32	629-62-9	NIST
2	HEPTADECANE	975	946	240	C17H36	629-78-7	NIST

Figure B19 Mass Spectrum of Peak Number 17 and 18

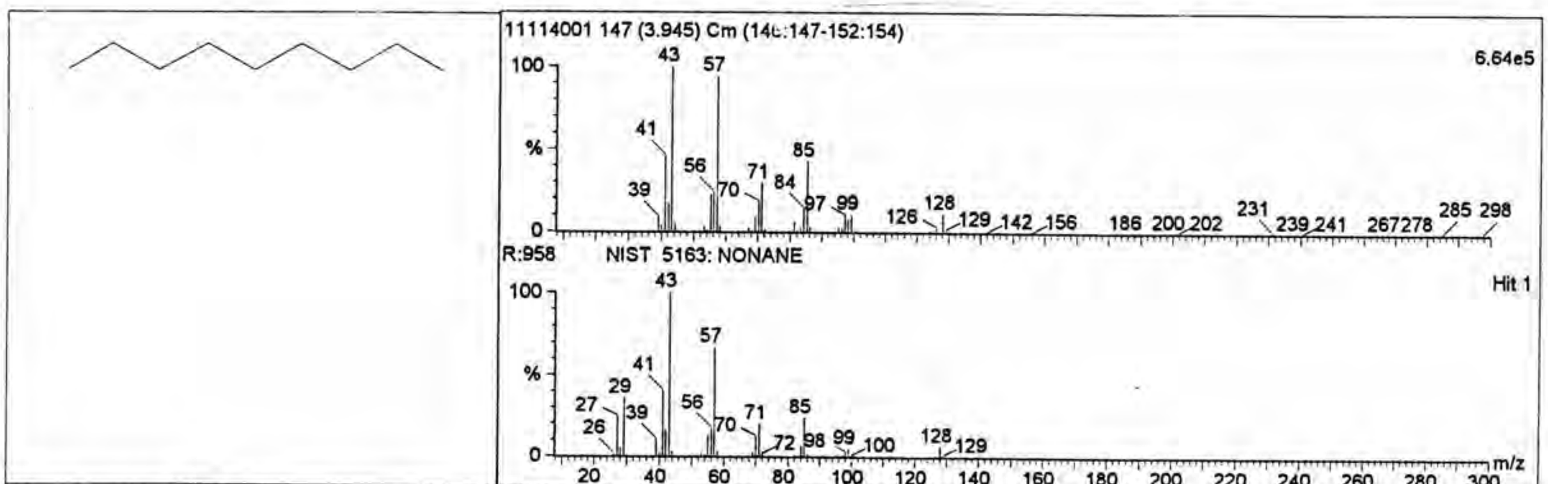


Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	NONADECANE	981	941	268	C19H40	629-92-5	NIST
2	HEXADECANE	981	956	226	C16H34	544-76-3	NIST



Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	HEXANE, 4-ETHYL-2-METHYL-	910	855	128	C9H20	3074-75-7	NIST
2	HEPTANE, 3-ETHYL-	901	796	128	C9H20	15869-80-4	NIST

Figure B20 Mass Spectrum of Peak Number 19 and 20



Hit	Compound Name	REV	for	M.W.	Formula	CAS	Library
1	NONANE	958	930	128	C9H20	111-84-2	NIST
2	4,4-DIMETHYLCYCLOOCTENE	957	826	138	C10H18	0-00-0	NIST

Figure B21 Mass Spectrum of Peak Number 21

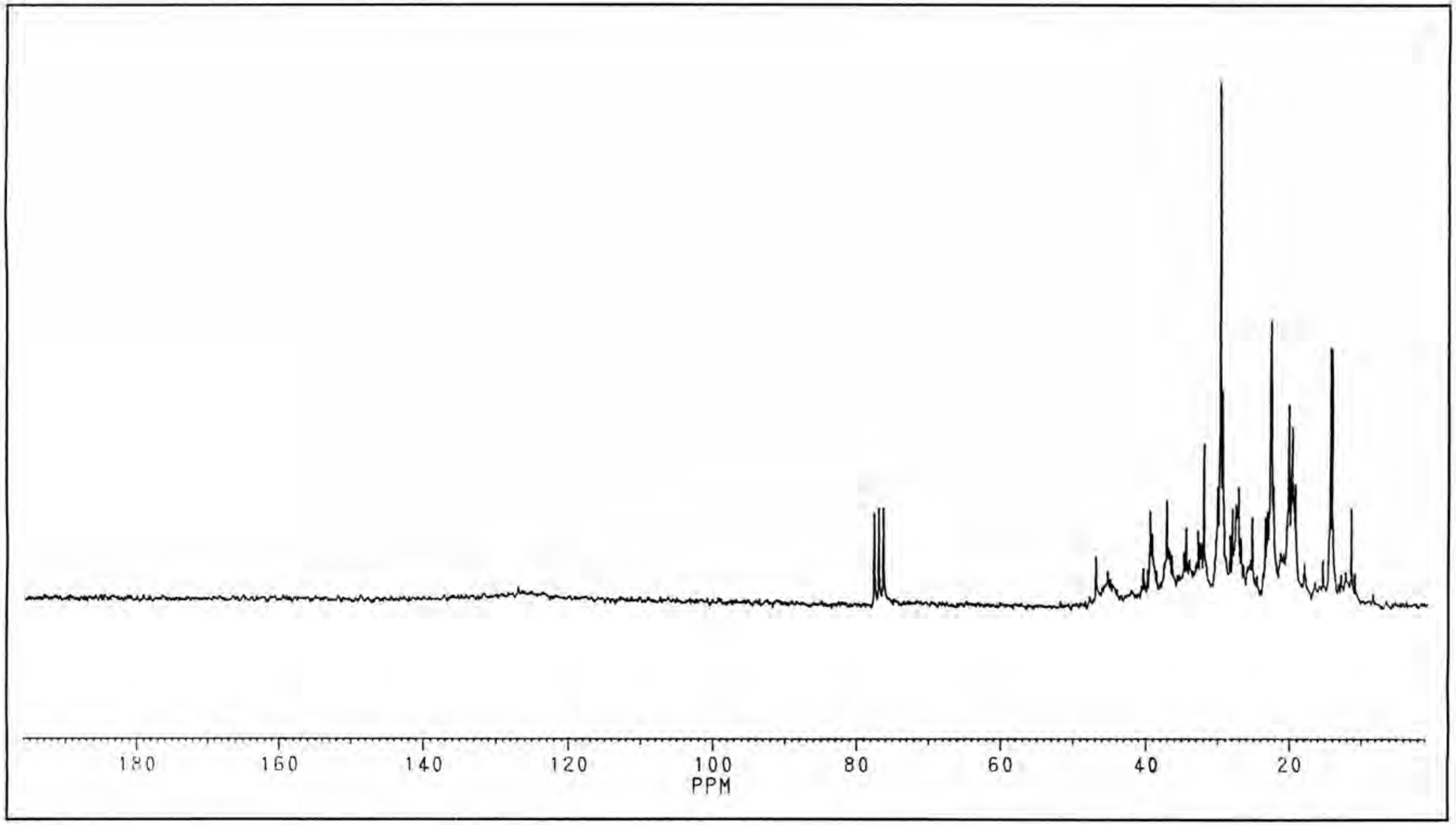


Figure B22 C^{13} NMR Spectrum of oil product from hydrocracking of used polypropylene at optimum condition (40%wt. of Ni(5%)-Sn(5%)-F(2%) on molecular sieve catalyst, 360°C, 500 psig, 6 hr.)

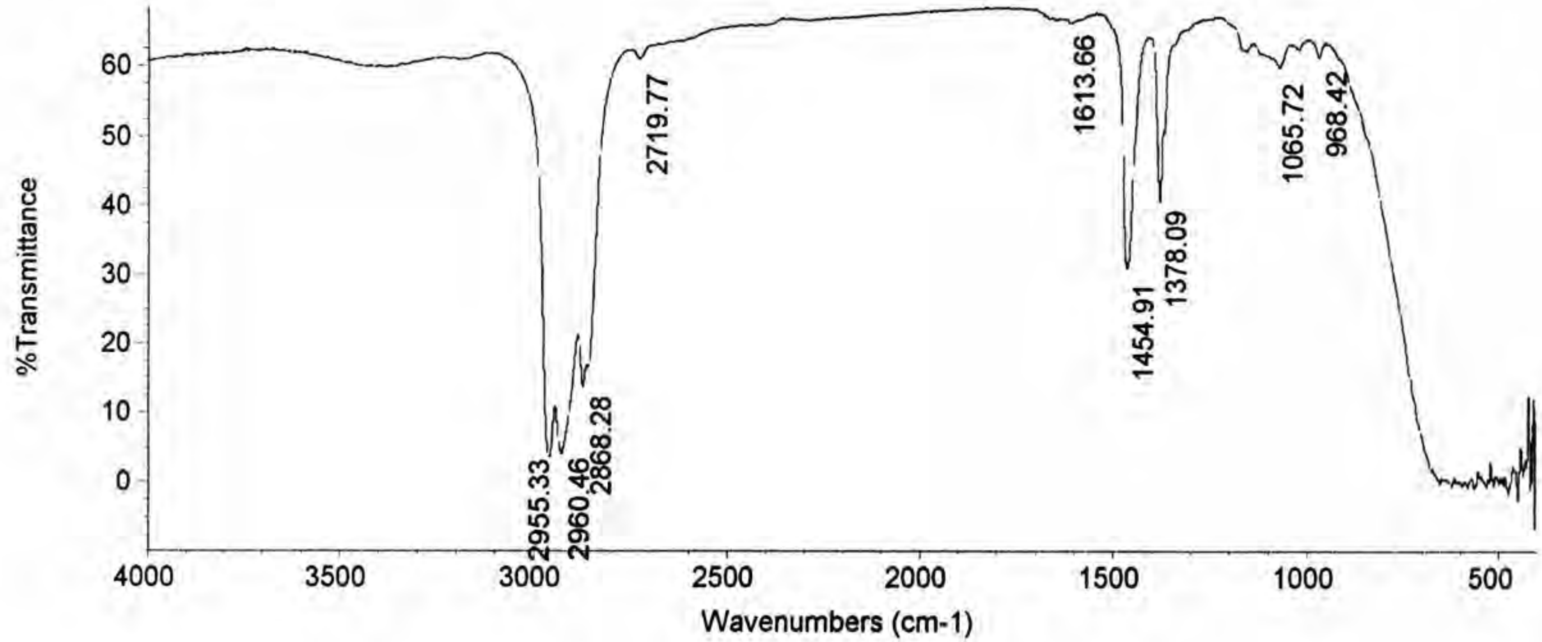


Figure B23 FTIR Spectrum of oil product from hydrocracking of used polypropylene at optimum condition (40%wt. of Ni(5%)-Sn(5%)-F(2%) on molecular sieve catalyst, 360°C, 500 psig, 6 hr.)

Table B10 ASTM D 86 Distillation of oil product from Ni(5%)-Sn(5%)-F(2%)/ MS and oil product from reproducibility at optimum condition (calculated cetane index 57.2 and 53.4 respectively)

Programme 18 JET-A

IBP	137.3 (136.2) °C	8mn0s (6mn57s)	
%	°C		W
1	146.0		86
2	149.3		86
3	152.4		86
4	155.2		91
5	157.0 (149.0)	82s (38s)	93
10	164.4 (155.6)	4.6 (6.0) %/mn	86
15	172.4	4.2 %/mn	98
20	181.0 (164.3)	4.2 (4.2) %/mn	107
25	190.9	4.3 %/mn	112
30	201.5 (177.7)	4.2 (4.4) %/mn	122
35	212.9	4.1 %/mn	132
40	224.6 (194.1)	4.2 (4.4) %/mn	142
45	236.1	4.1 %/mn	156
50	249.1 (213.6)	4.1 (4.2) %/mn	168
55	263.1	4.0 %/mn	186
60	278.8 (235.1)	3.8 (4.1) %/mn	211
65	295.6	3.8 %/mn	235
70	314.2 (261.1)	3.7 (4.0) %/mn	268
75	332.8	3.5 %/mn	307
80	348.3 (294.4)	3.8 (3.6) %/mn	328
85	354.9	5.3 %/mn	293
90	348.1 (347.0)	8.1 (2.8) %/mn	201
91	347.2	8.3 %/mn	169
92	345.6	9.0 %/mn	146
93	343.7	9.3 %/mn	126
94	341.4	21mn37s	102

FBP	0.0 % 341.4°C	0mn0s
Total recovery		89.6%
Percent residue		0.0%
Corrected loss		10.4%
Corrected total recovery		89.6%
Volume#1 at.. 200°C		29.3%

Table B11 ASTM D 86 Distillation of oil product from Fe(5%)-Sn(5%)-F(2%)/ MS at optimum condition of nickel catalyst (calculated cetane index 67.0)

Programme 16 JET-A

IBP	150.3 °C	8mn54s	
%	°C		W
1	154.9		86
2	159.0		86
3	161.4		86
4	164.6		91
5	167.2	85	93
10	177.1	4.1 %/mn	86
15	190.7	4.0 %/mn	98
20	204.1	4.1 %/mn	107
25	218.2	4.2 %/mn	112
30	233.0	4.0 %/mn	122
35	247.9	4.0 %/mn	132
40	264.4	3.7 %/mn	142
45	282.9	3.7 %/mn	156
50	301.4	3.7 %/mn	168
55	318.2	3.9 %/mn	186
60	328.5	4.9 %/mn	211
65	330.9	5.6 %/mn	235
70	329.1	6.6 %/mn	268
75	318.5	5.7 %/mn	307
80	307.9	4.1 %/mn	328
85	311.9	3.8 %/mn	293
90	317.8	4.0 %/mn	201
91	319.8	3.9 %/mn	169
92	320.8	3.8 %/mn	146
93	321.1	4.0 %/mn	126
94	319.6	22mn19s	102

FBP	0.0 % 319.6°C	0mn0s
Total recovery		96.0%
Percent residue		0.0%
Corrected loss		4.0%
Corrected total recovery		96.0%
Volume#1 at.. 200°C		18.6%

VITA

Miss Jinda Yeyongchaiwat was born on February 1, 1974 in Bangkok, Thailand. She received her Bachelor of Science degree in Chemistry, Chulalongkorn University in 1994. She continued her studies towards her Master's degree at Chulalongkorn University, Multidisciplinary program of Petrochemistry and Polymer, Graduate School, in 1995 and completed the program in 1997.