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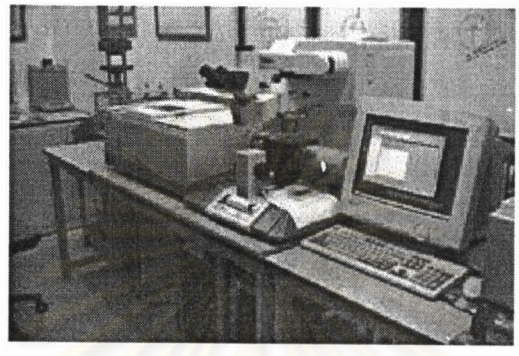
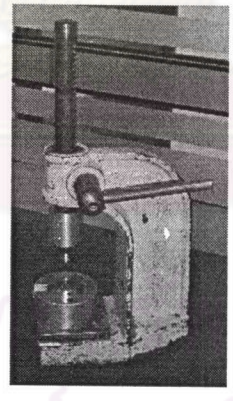
APPENDICES

APPENDIX A

PICTURES OF INSTRUMENTS AND ACCESSORIES



Nicolet Magna 750 Series II FT-IR spectroscopy

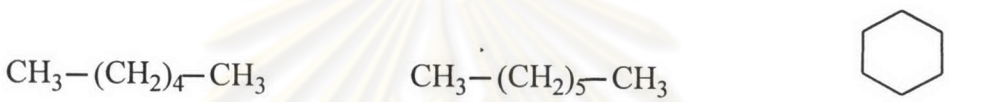


The instrument for cutting PVC sheet

APPENDIX B

FT-IR SPECTRA AND PEAK ASSIGNMENT OF VOLATILE LIQUID COMPOUNDS

1. Non-polarity type of volatile liquid compounds (*i.e.*, hexane, heptane and cyclohexane)



Hexane Heptane Cyclohexane

Figure 1 Chemical structure of hexane, heptane and cyclohexane

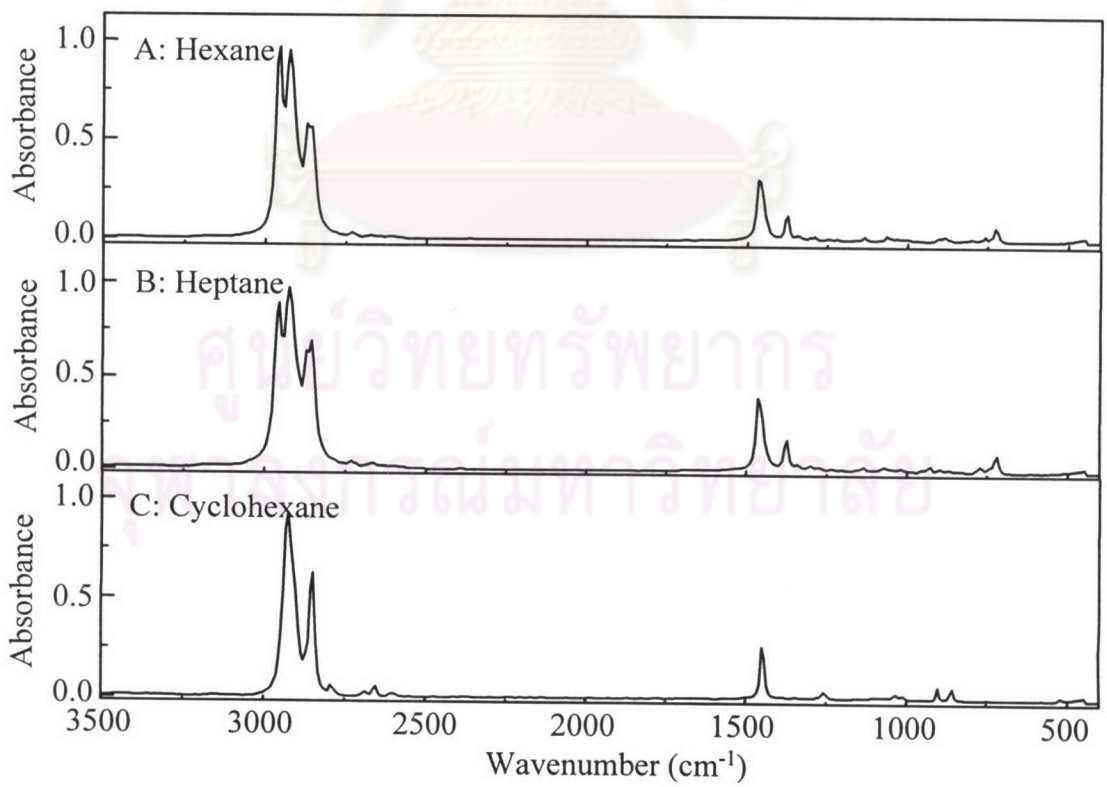
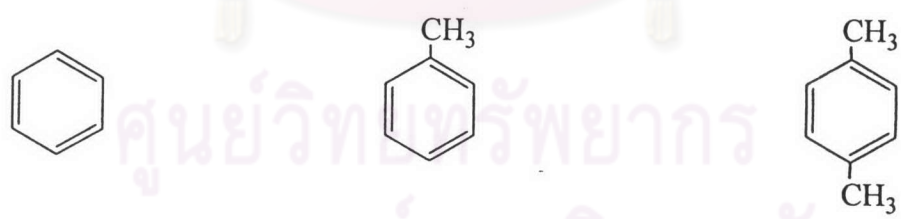


Figure 2 FT-IR spectra of hexane (A), heptane (B), and cyclohexane (C)

Table 1 Peak assignments of hexane, heptane and cyclohexane

Wavenumber (cm^{-1})	Peak assignment
Hexane and Heptane	
2955	CH_3 Asymmetric stretching
2928	CH_2 Asymmetric stretching
2869	CH_3 Symmetric stretching
2858	CH_2 Symmetric stretching
1460	CH_3 Asymmetric bending
1374	CH_3 Symmetric bending (umbrella mode)
722	CH_2 Rocking
Cyclohexane	
2916	CH_2 Asymmetric stretching
2850	CH_2 Symmetric stretching
1452	CH_2 Bending
897, 858	Ring stretching mode

2. Low polarity type of volatile liquid compounds (i.e., benzene, toluene and *p*-xylene)



Benzene Toluene *p*-Xylene

Figure 3 Chemical structure of benzene, toluene and *p*-xylene

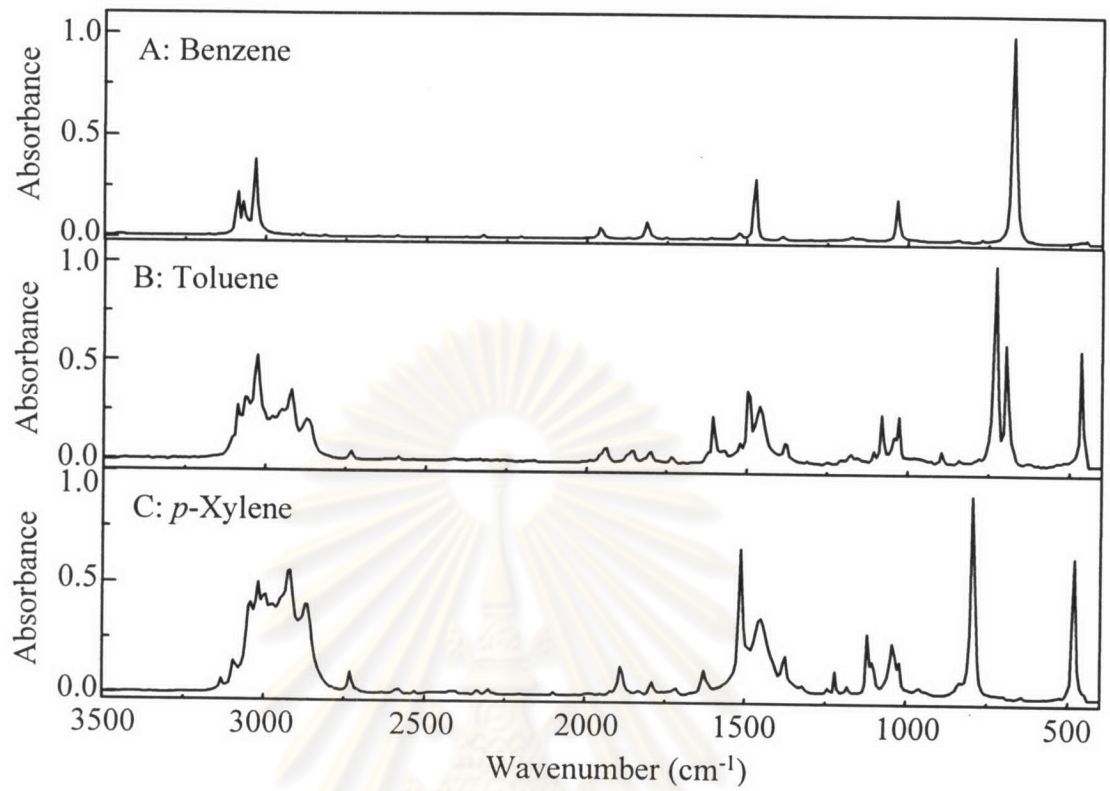


Figure 4 FT-IR spectra of benzene (A), toluene (B), and *p*-xylene (C)

Table 2 Peak assignment of benzene, toluene and *p*-xylene

Wavenumber (cm^{-1})	Peak assignment
<u>Benzene</u>	
3083,3020,3065	CH stretching of aromatic ring
1526,1467,1390	Ring mode
1035	In-plane of CH bending
671	Out-of –plane CH bending
<u>Toluene</u>	
3083,3052,3025	CH stretching of aromatic ring
2920,2862	CH_3 stretching
1600,1491,1452	Ring mode
1076,1025	In-plane of CH bending

Table 2 Peak assignment of benzene, toluene and *p*-xylene (continued)

Wavenumber (cm^{-1})	Peak assignment
Toluene	
722	Out-of –plane CH bending
695	C-C bending in aromatic ring
p-Xylene	
3091,3033,3013	CH stretching of aromatic ring
2916,2870	CH_3 stretching
1511, 1452, 1374	Ring mode
1045, 1023	In-plane of CH bending
792	Out-of –plane CH bending

3. Moderate polarity type of volatile liquid compounds (*i.e.*,ethanol, isopropanol and acetone)

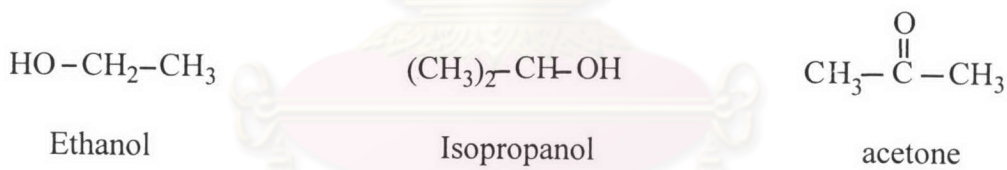


Figure 5 Chemical structure of ethanol, isopropanol and acetone

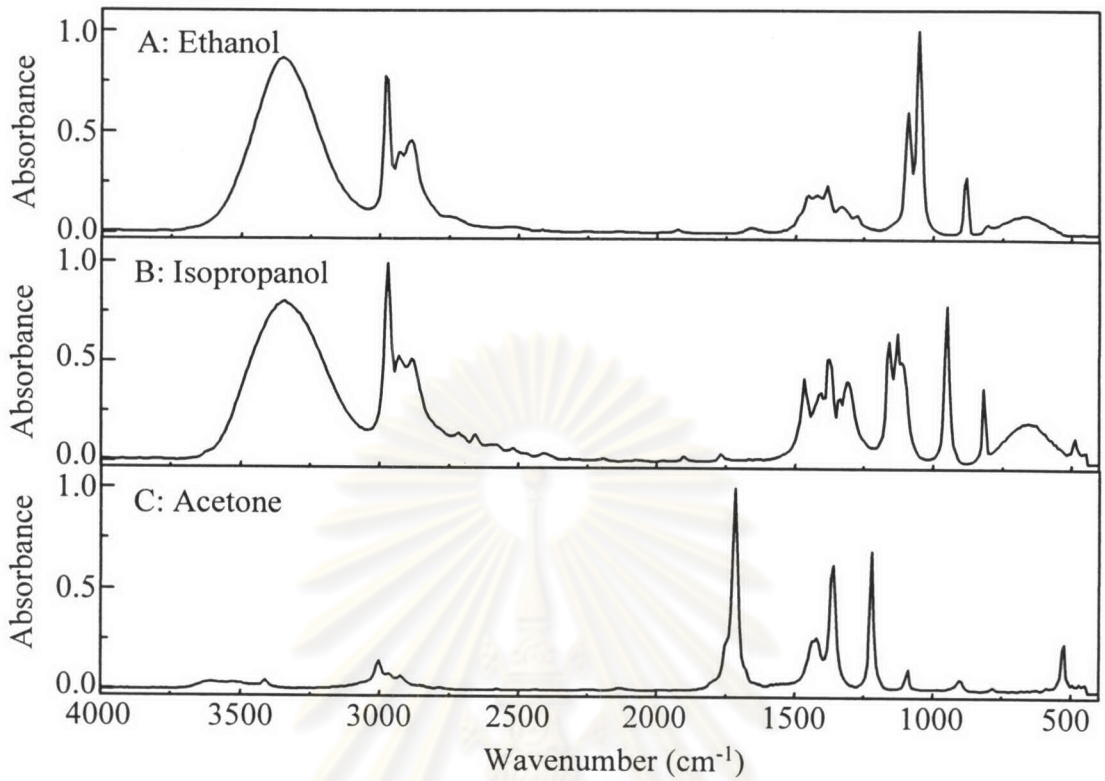


Figure 6 FT-IR spectra of ethanol (A), isopropanol (B) and acetone (C)

Table 3 Peak assignment of ethanol, isopropanol and acetone

Wavenumber (cm^{-1})	Peak assignment
Ethanol	
3350	OH stretching
2975, 2885	CH_3 stretching
2924	CH_2 stretching
1448	CH_2 bending
1382	CH_3 bending
1324	In-plane of OH bending
1052	C-C-O asymmetric stretching
877	C-C-O symmetric stretching

Table 3 Peak assignment of ethanol, isopropanol and acetone (continued)

Wavenumber (cm^{-1})	Peak assignment
Isopropanol	
3347	OH stretching
2959,2881	CH_3 stretching
2928	CH_2 stretching
1375,1369	CH_3 bending (umbrella mode)
1305	In-plane of OH stretching
1122	C-C-O asymmetric stretching
947	CH_3-C-CH_3 stretching
819	C-C-O symmetric stretching
655	Out-of-plane of OH bending
Acetone	
2966, 2920	CH_3 stretching
1712	C=O stretching
1421,1363	CH_3 bending
1219	C-C-C stretching

4. High polarity type of volatile liquid compounds (*i.e.*, methanol and diethylene glycol)

$HO-CH_3$ $(HOCH_2CH_2)_2O$

Methanol Diethylene glyco

Figure 7 Chemical structure of methanol and diethylene glycol

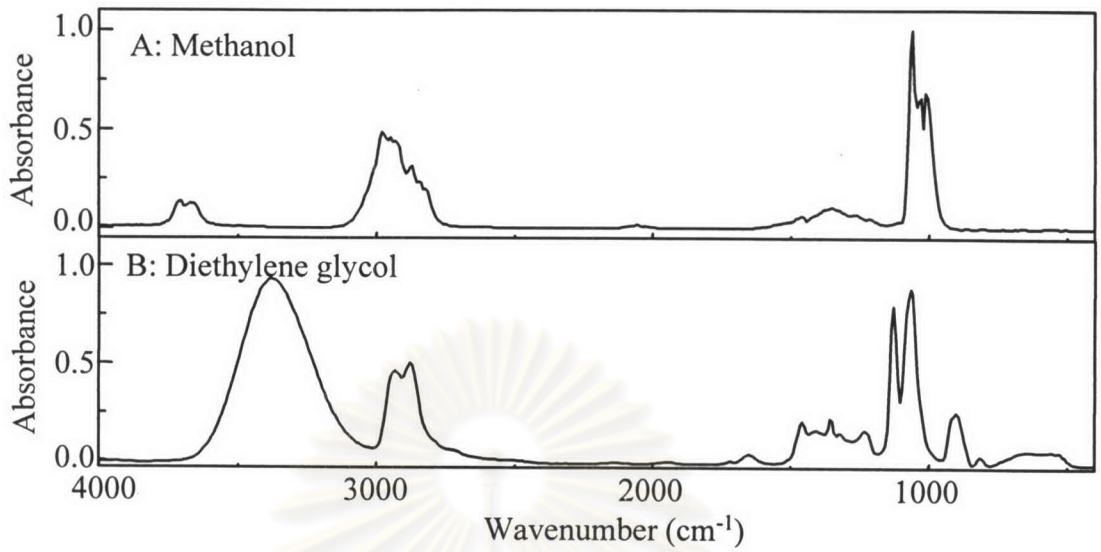


Figure 8 FT-IR spectra of methanol (A) and diethylene glycol (B)

Table 4 Peak assignment of methanol and diethylene glycol

Wavenumber (cm^{-1})	Peak assignment
Methanol	
3343	OH stretching
2936, 2831	CH_2 stretching
1452	CH_2 bending
1025	C-O stretching
Diethylene glycol	
3374	OH stretching
2928	CH_2 stretching
2881	CH_3 stretching
1452, 1355	CH_2 bending
1122, 1064	C-O-C asymmetric stretching
900	C-O-C symmetric stretching

Table 5 Chemical property of volatile organic solvent

Volatile organic	Formula	Boiling point (°C)	Melting point (°C)	Density (g/ml)	Relative polarity
Methanol	CH_4O	64.6	-98	0.791	0.762
Diethylene glycol	$C_4H_{10}O_3$	245	-10	1.118	0.713
Ethanol	C_2H_6O	78.5	-114.4	0.789	0.654
Isopropanol	C_3H_8O	82.4	-88.5	0.785	0.546
Acetone	C_3H_6O	56.2	-94.3	0.786	0.355
Benzene	C_6H_6	80.1	5.5	0.879	0.111
Toluene	C_7H_8	110.6	-93	0.867	0.099
p-Xylene	C_8H_{10}	138.3	13.3	0.861	0.074
Hexane	C_6H_{14}	69	-95	0.655	0.009
Cyclohexane	C_6H_{12}	80.7	6.6	0.779	0.006
Heptane	C_7H_{16}	98	-90.6	0.684	0.012

VITAE

Miss Srinual Jumpangern was born in Suphanburi, Thailand, on April 27th, 1975. She received bachelor degree of science in 1998 from Department of Chemistry, Faculty of Science, Ramkhamhaeng University. She started as a master degree student with a major in Petrochemistry Science, Program on Petrochemistry and Polymer Science, Chulalongkorn University in 2001 and completed program in 2004.