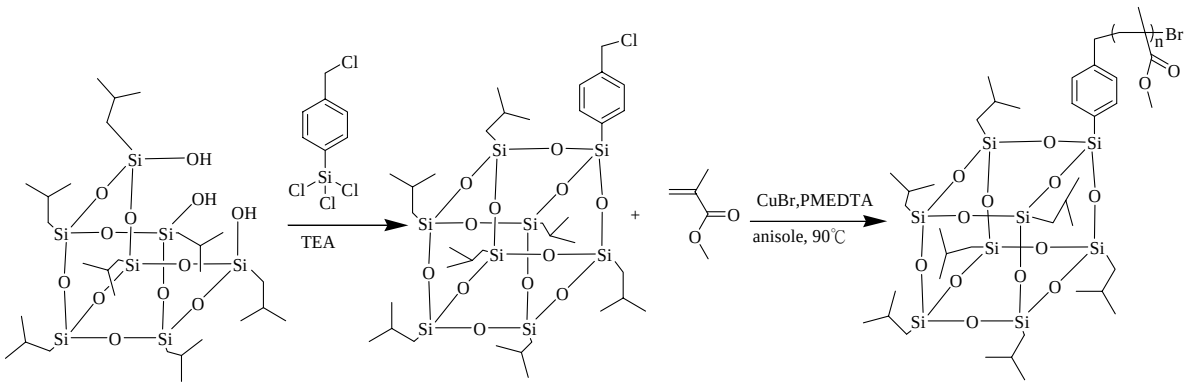
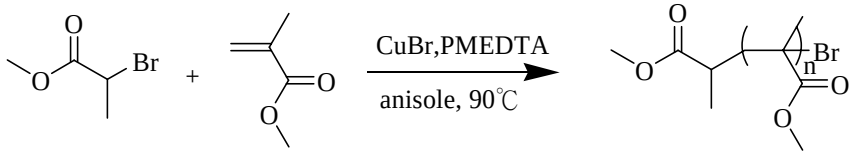
Table 4.1. *Carbonyl group curve-fitting results of the (a) LPMMA, (b) POSS-LPMMA, (c) HPMMA, and (d) POSS-HPMMA /phenolic blends.*

Samples(wt%)	Free C=O		H-bonded C=O		fb[a](%)
	ν_f(cm^{-1})	A_f(%)	ν_b(cm^{-1})	A_b(%)	
(a)PMMA/phenolic					
70 /30	1731.2	69.31	1705.3	30.78	22.8
50 /50	1731.2	45.04	1705.9	55.04	44.9
30 /70	1731.3	38.64	1705.2	61.36	51.4
10 /90	1731.1	38.28	1705.2	61.72	51.8
(b)POSSPMMA/phenolic					
70 /30	1731.3	78.63	1705.3	21.37	15.3
50 /50	1731.2	71.34	1705.2	28.66	21.1
30 /70	1731.5	64.72	1705.7	35.28	26.6
10 /90	1731.6	60.04	1705.1	39.96	30.7
(c)PMMA/phenolic		.			
70 /30	1731.3	56.83	1705.3	43.17	33.6
50 /50	1731.5	54.22	1705.2	55.78	40.6
30 /70	1731.2	42.64	1705.6	57.36	47.2
10 /90	1731.6	38.56	1705.2	61.44	51.5
(d)POSSPMMA/phenolic					
70 /30	1730.4	58.82	1705.3	41.18	31.8
50 /50	1731.2	55.96	1705.3	44.04	34.4
30 /70	1730.7	47.51	1705.5	52.49	42.4
10 /90	1731.1	38.72	1705.1	61.28	51.3

ν_f : wavenumber of free C=O of PMMA； ν_b : wavenumber of hydrogen bonded carbonyl of PMMA； A_f : fress C=O area fraction of PMMA； A_b : C=O area fraction of hydrogen bonded PMMA. fb[a] : fraction of hydrogen bonded PMMA=$(A_b/1.5)/(A_b/1.5+A_f)$.

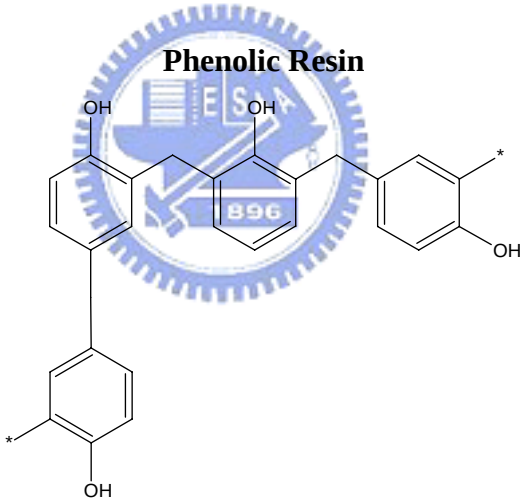


POSS-Cl POSS-PMMA

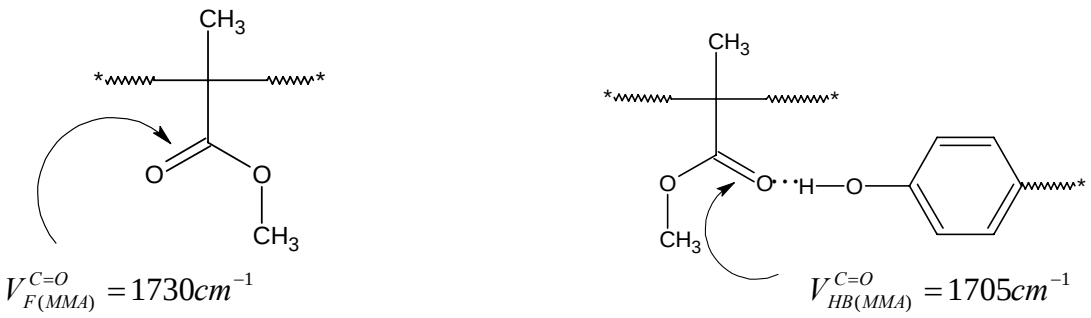


MBP PMMA

Scheme 4.1. *The synthesis of POSS-Cl initiator and ATRP of MMA.*



PMMA



Scheme 4.2. *Schematic diagram showing carbon number and type of interaction between PMMA and phenolic resins.*

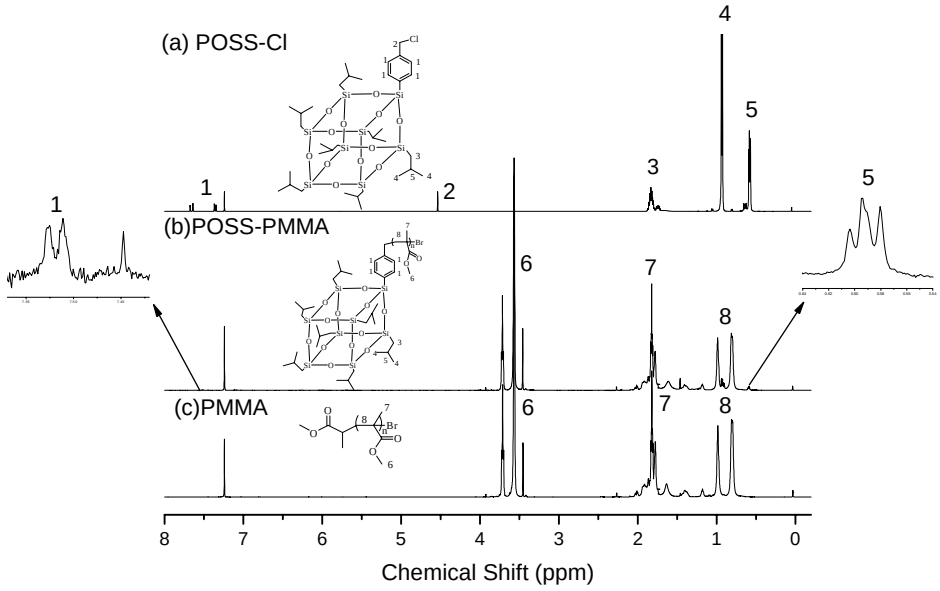


Figure 4.1. *The [1]H-NMR spectra of (a) POSS-Cl, (b) POSS-PMMA, and (c) PMMA.*

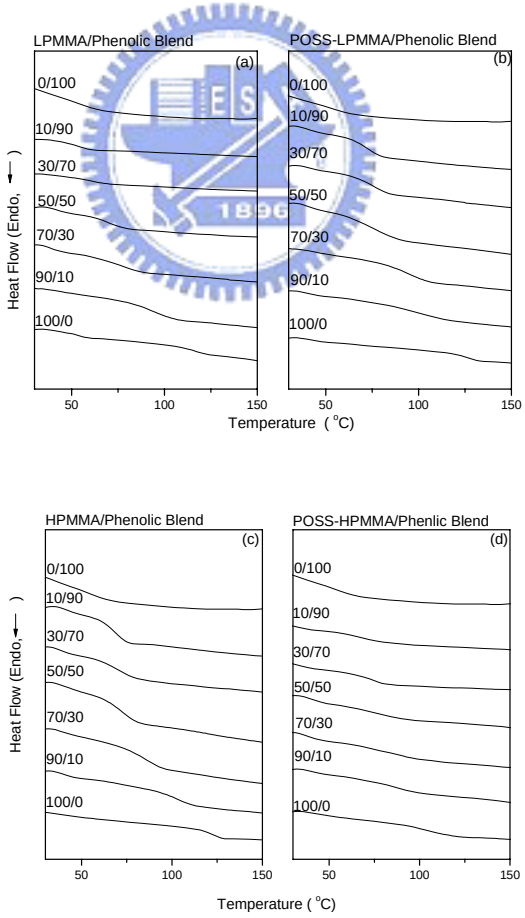


Figure 4.2. *The DSC curves of (a) LPMMA, (b) POSS-LPMMA, (c) HPMMA, and (d) POSS-HPMMA/phenolic blends with different compositions (weight ratio).*

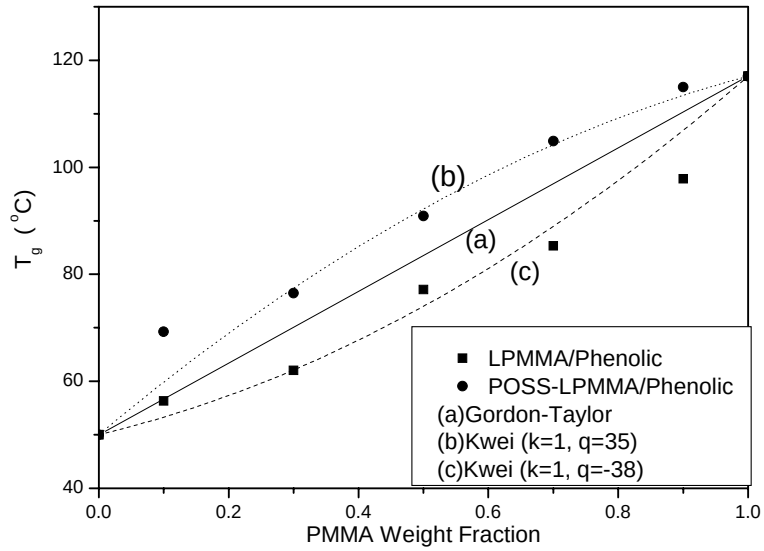


Figure 4.3. *The T_g vs. composition curves based on (a) the Gordon-Taylor equation, (b) the Kwei equation for POSS-LPMMA/phenolic blends, (c) the Kwei equation for LPMMA/ phenolic blends, (■) experimental date of LPMMA/phenolic blends, and (●) experimental date of POSS-LPMMA/phenolic blends.*

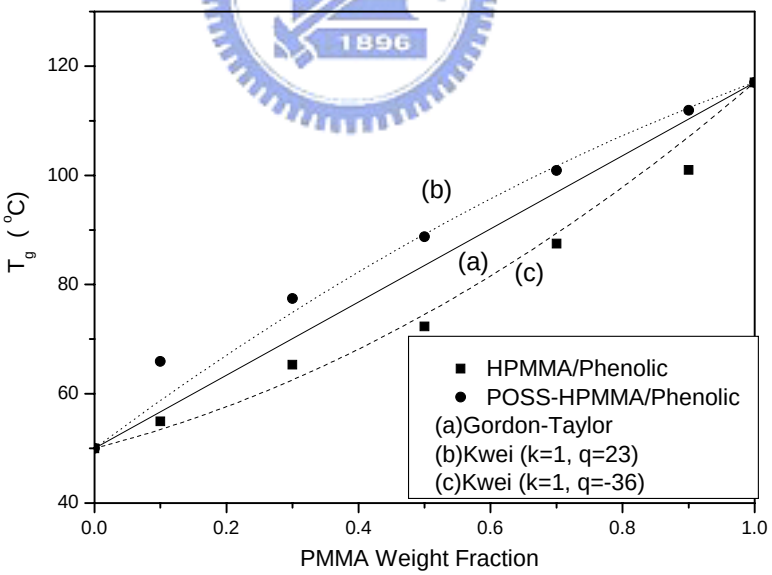


Figure 4.4. *The T_g vs. composition curves based on (a) the Gordon-Taylor equation, (b) the Kwei equation for POSS-HPMMA/phenolic blends, (c) the Kwei equation for HPMMA/ phenolic blends, (■) experimental date of HPMMA/phenolic blends, and (●) experimental date of POSS-HPMMA/phenoilc blends.*

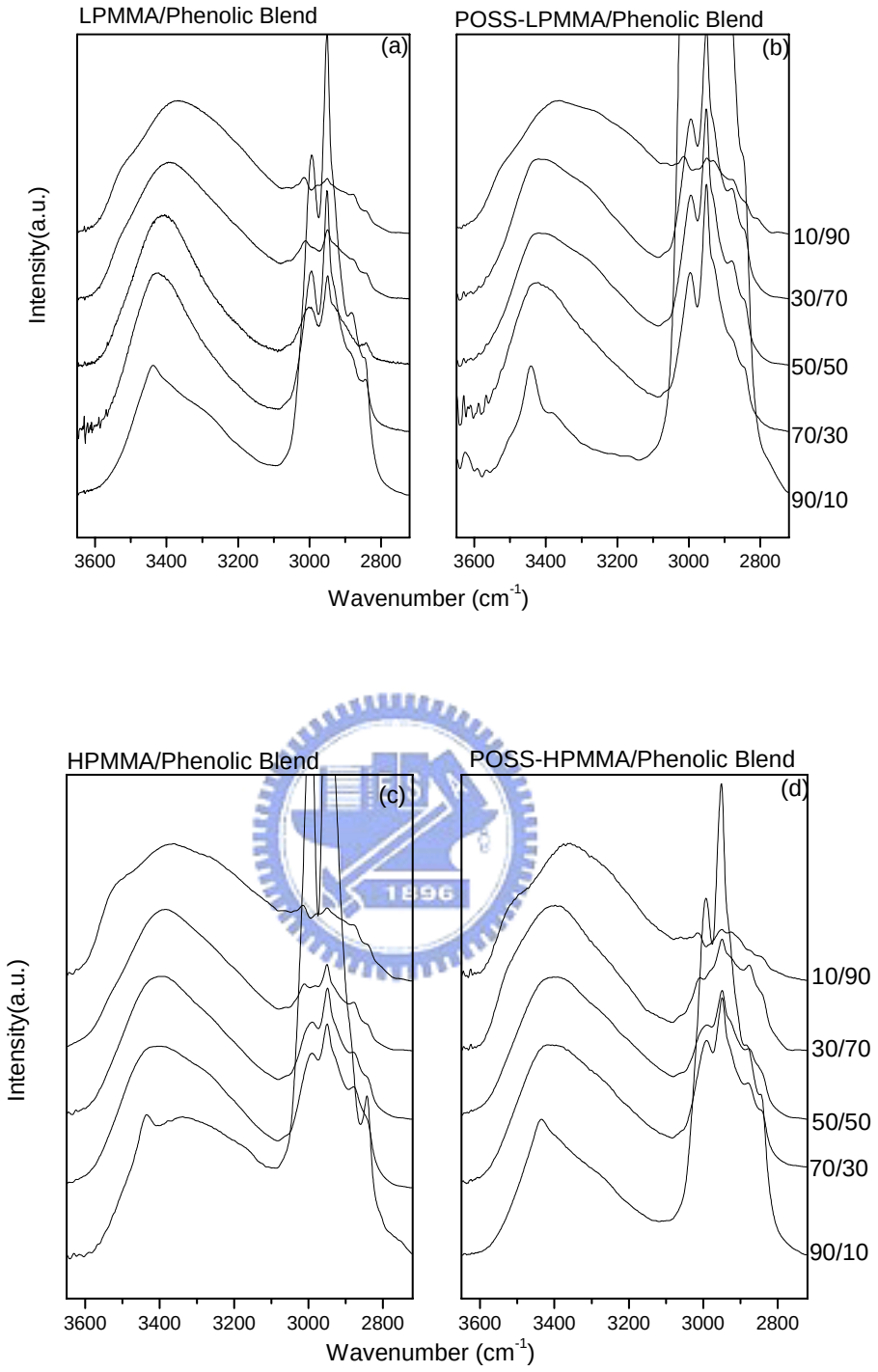


Figure 4.5. *FTIR spectra at room temperature in the 2700-3700 cm^{-1} region for (a) LPMMA, (b) POSS-LPMMA, (c) HPMMA, and (d) POSS-HPMMA/phenolic blends with different compositions (weight ratio).*

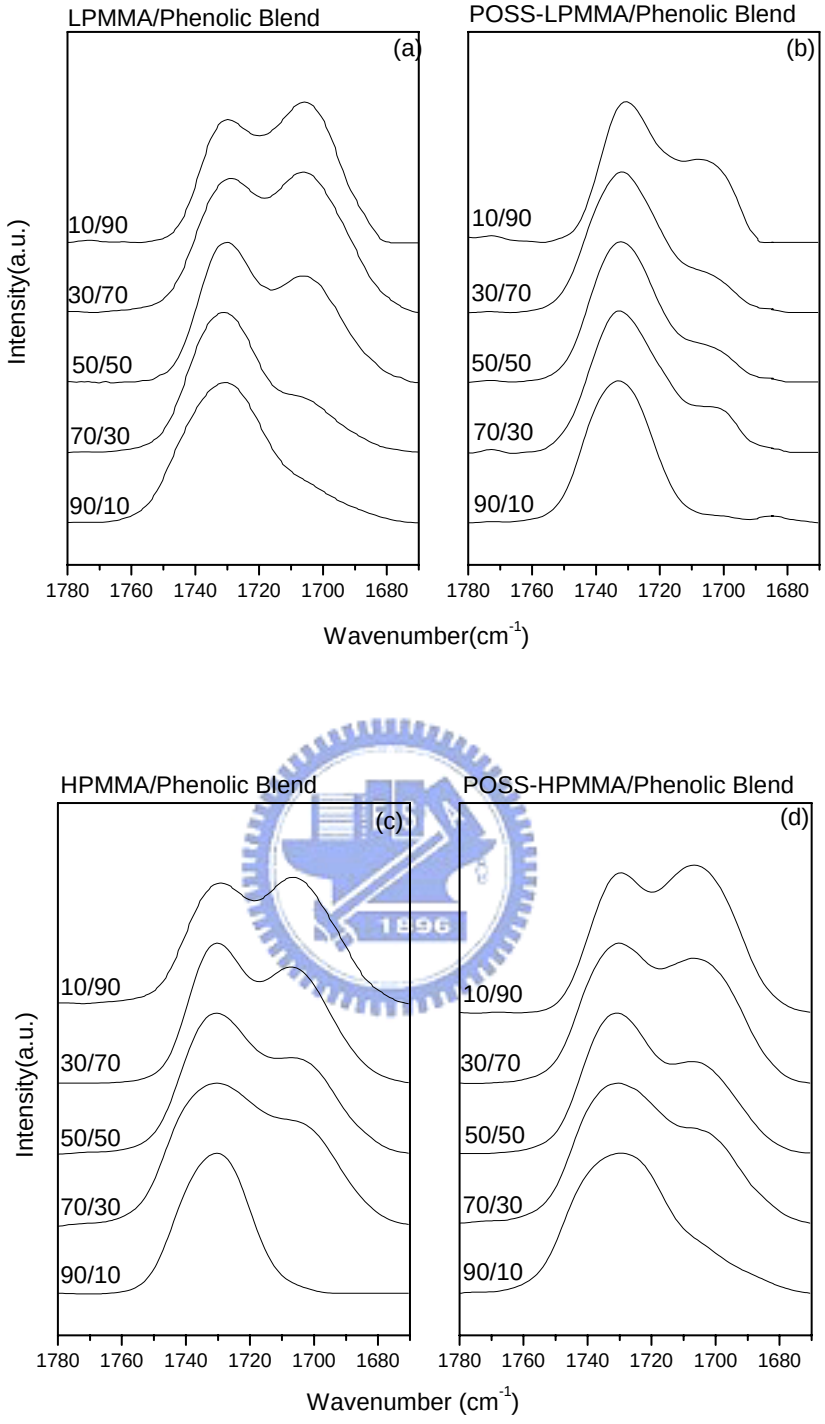


Figure 4.6. *FTIR spectra at room temperature in the 1675-1765 cm^{-1} region for (a) LPMMA, (b) POSS-LPMMA, (c) HPMMA, and (d) POSS-HPMMA/phenolic blends with different compositions (weight ratio).*

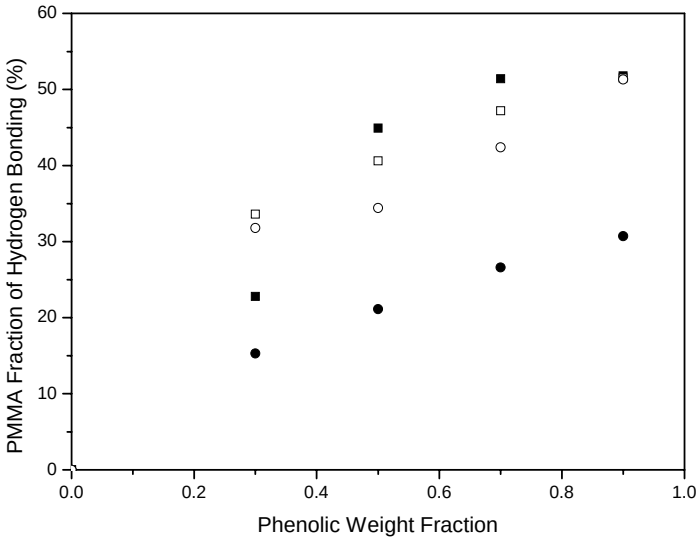


Figure 4.7. *The fraction of hydrogen bonded carbonyl vs. phenolic content for (a) LPMMA/phenolic (■), (b) POSS-LPMMA/phenolic (●), (c) HPMMA/phenolic (□), and (d) POSS-HPMMA/phenolic blends (○), from FTIR spectra.*

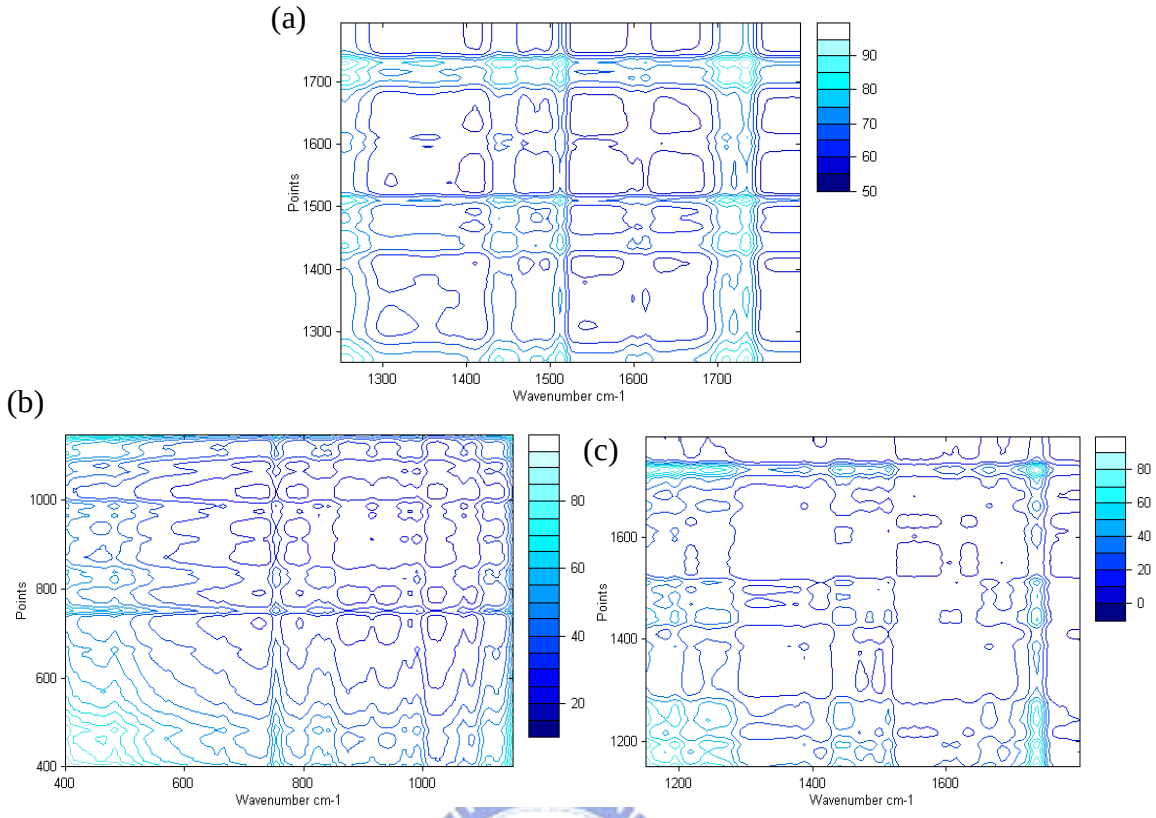


Figure 4.8. *2D IR spectra at room temperature for (a) LPMMA/phenolic blends in the 1250-1800cm^{-1} region, (b) POSS-LPMMA/phenolic blends in the 400-1150 cm^{-1} region, and (c) POSS-LPMMA/phenolic blends in the 1150-1800 cm^{-1} region.*

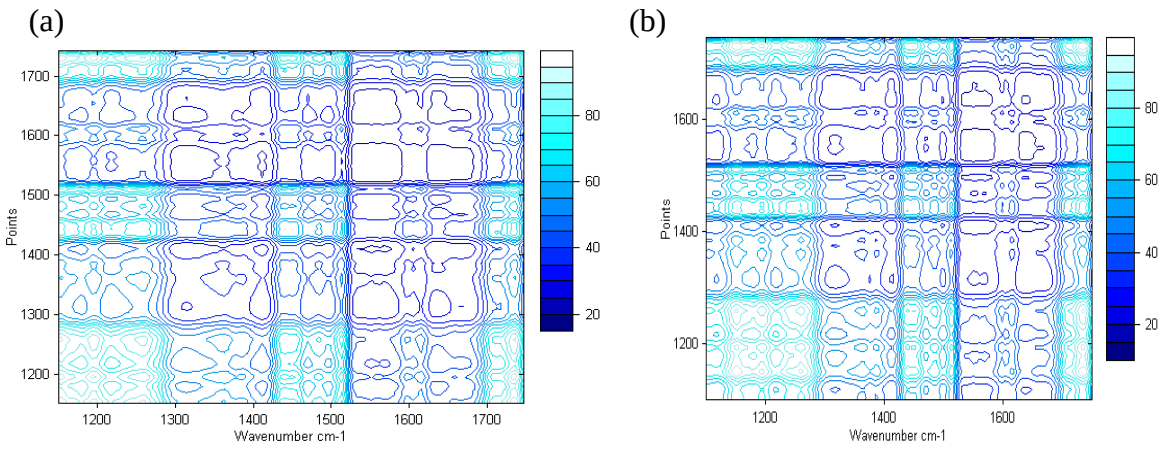


Figure 4.9. *2D IR spectra at room temperature for (a) HPMMA/phenolic and (b) POSS-HPMMA/phenolic blends in the 1150-1750 cm^{-1} region.*

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