

Effect of functional group ratio ([OH]/[NCO]) on Polyurethane Pressure-sensitive Adhesives (PU-PSA)

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Abstract

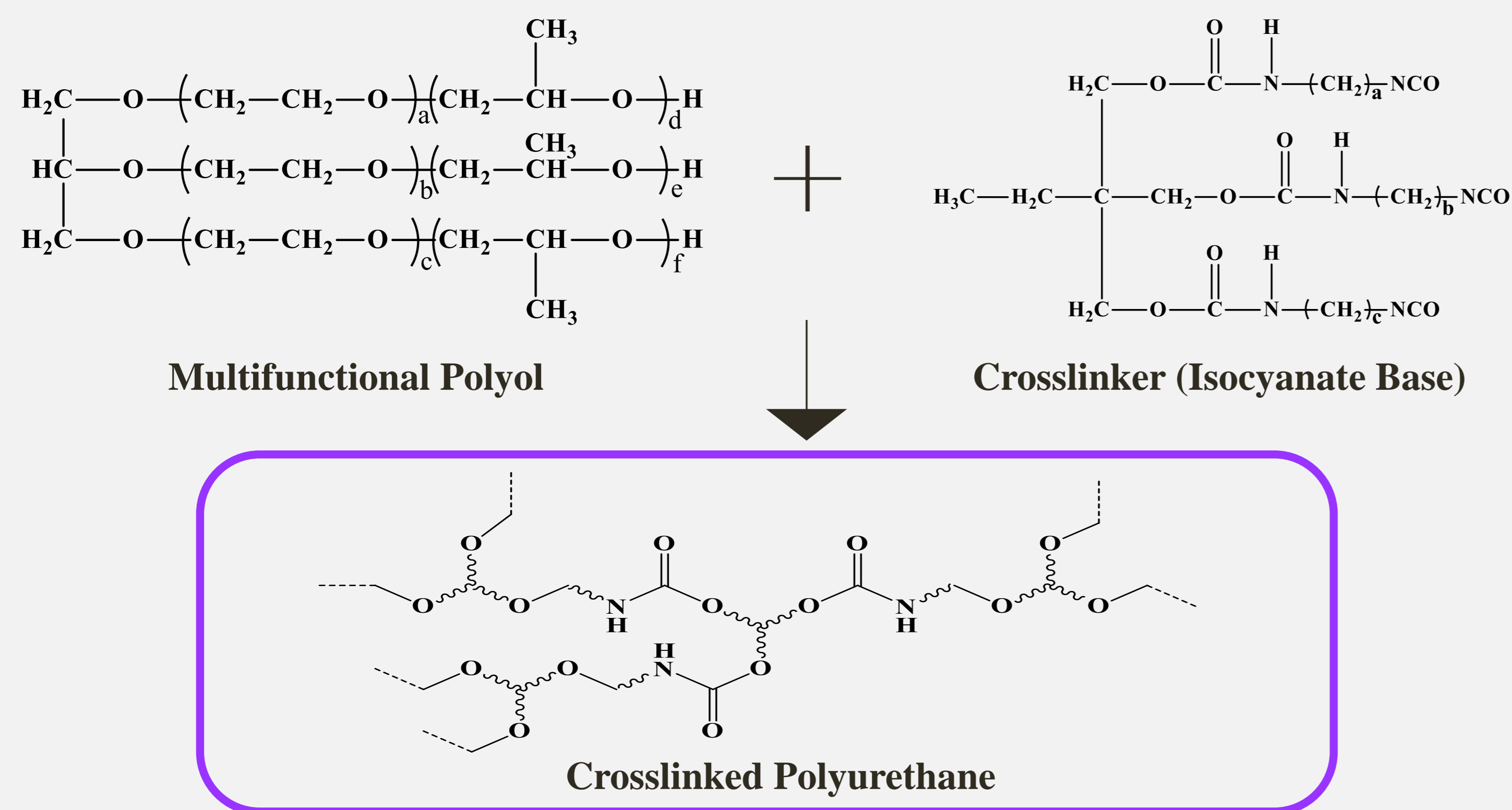
Polyurethane pressure-sensitive adhesives (PU-PSA) with high durability and removability were achieved through various polyols, isocyanates, and additives studies. To estimate PUs synthesized with control of mole ratio of Hydroxyl group/Isocyanate group ([OH]/[NCO]), degree of crosslinking was analyzed through reduction of NCO group peak in Fourier-transform infrared (FT-IR) spectroscopy. The structures of the synthesized PU-PSAs were analyzed by FT-IR spectroscopy. One hundred eighty-degree peel tests by universal testing machine (UTM) were used to evaluate mechanical peel properties of PU-PSAs.

Objective

1. Synthesis of PU-PSA with no residue when exfoliating
2. Adjust adhesion strength of the PU-PSA
3. Estimate success of synthesis and performance of PU-PSA through FT-IR, UV-VIS, and UTM

Experimental

Scheme



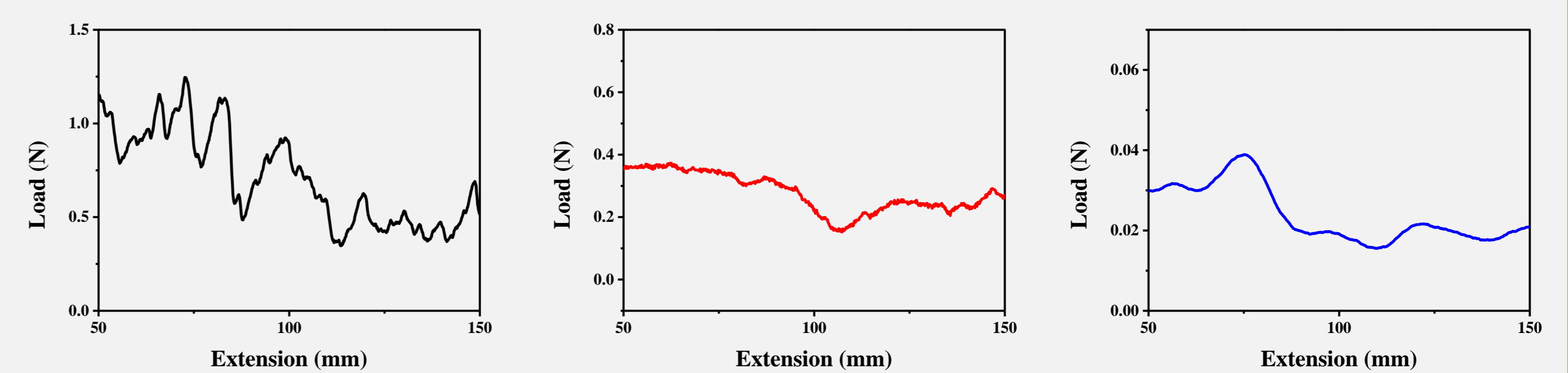
(unit: mole)	Base Polyurethane				Crosslinker	
	functional group	3	2	2	2	3
Sample	Polyol 1	Isocyanate 1	Polyol 2	Polyol 3	Isocyanate 2	Isocyanate 3
#1	30	25	1		7.2	2.4
#2	30	25	1		21.6	2.4
#3	30	25		1	21.6	2.4

Results

After 180° Peel Test

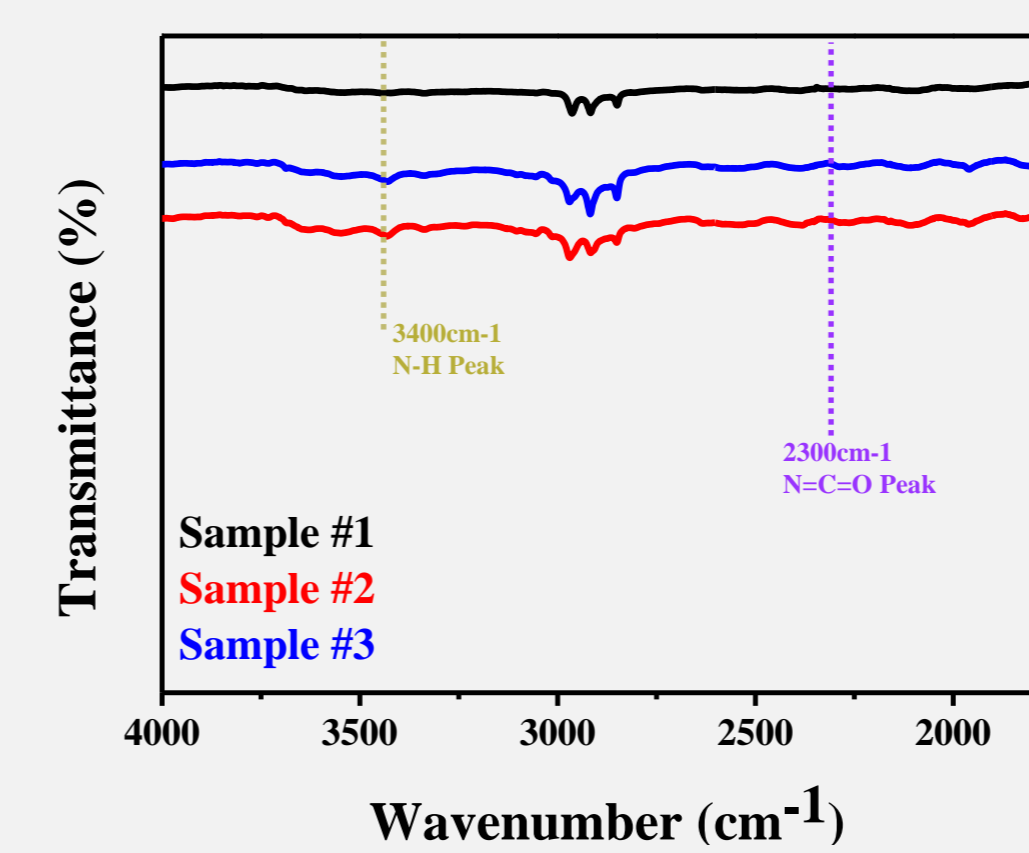


UTM 180° Peel Test



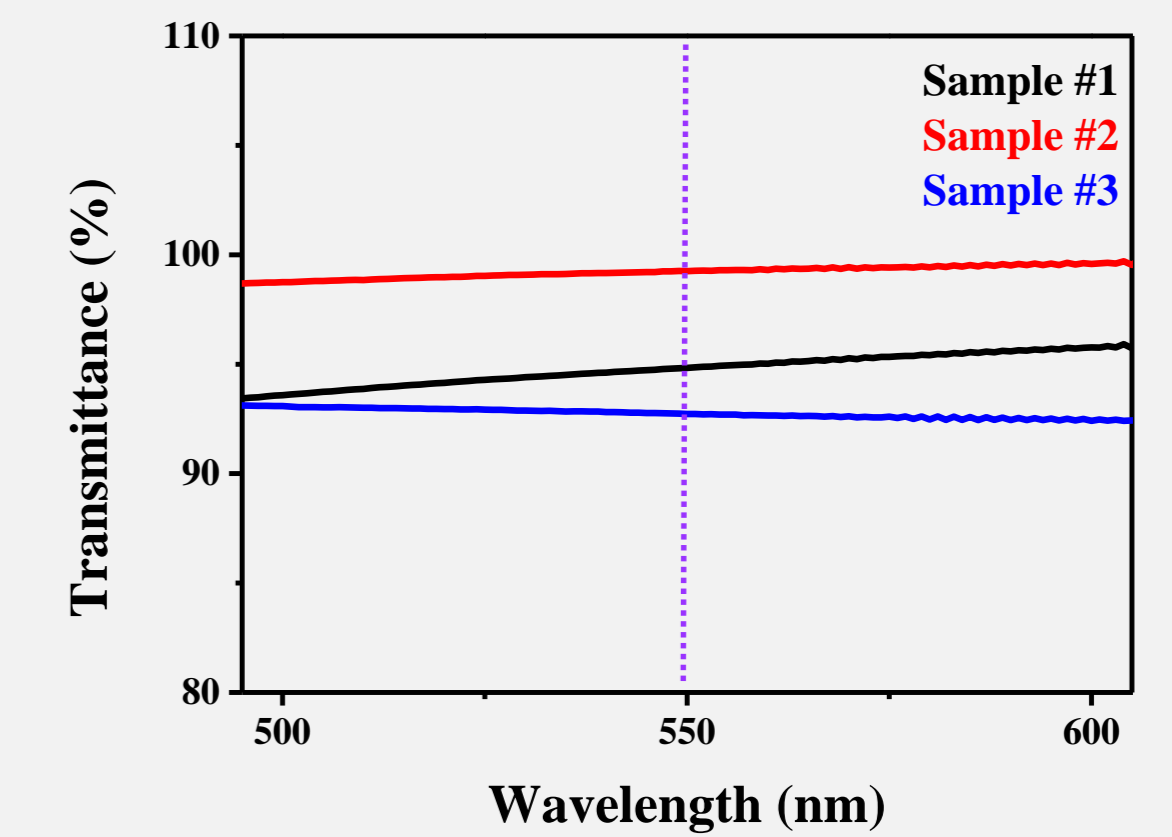
Sample #1	Load(N)	Sample #2	Load(N)	Sample #3	Load(N)
Maximum	1.246	Maximum	0.372	Maximum	0.046
Average	0.717	Average	0.279	Average	0.024

FT-IR



Sample	NCO Peak(2300cm ⁻¹)
#1	Disappeared
#2	Disappeared
#3	Disappeared

UV-VIS



Sample	Transmittance(550nm, %)
#1	94.83
#2	99.25
#3	92.73

* All analysis was performed by applying Polyurethane-PSA to the PET Film as 15μm thick.

Conclusion

- PU-PSA without residue when exfoliating was synthesized successfully
- Checked reduction of NCO Peak and N-H Peak through FT-IR
- Successfully varied adhesion strength while without remaining residue
- Sufficient transmittance applicable as a commercial PSA (over 90%)

Acknowledgement

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