

Development of Polyurethane pressure-sensitive adhesive capable of controlling adhesion through molecular design

Lee Ju Hong¹, Chung Ryeol Kwon, Jin Gyu Min, Jong Chan Won, Ji Hong Bae, Pil Ho Huh^{1*}
Department of Polymer Science and Engineering, Pusan National University, Busan 609-735, Korea
* pilho.huh@pusan.ac.kr

Abstract

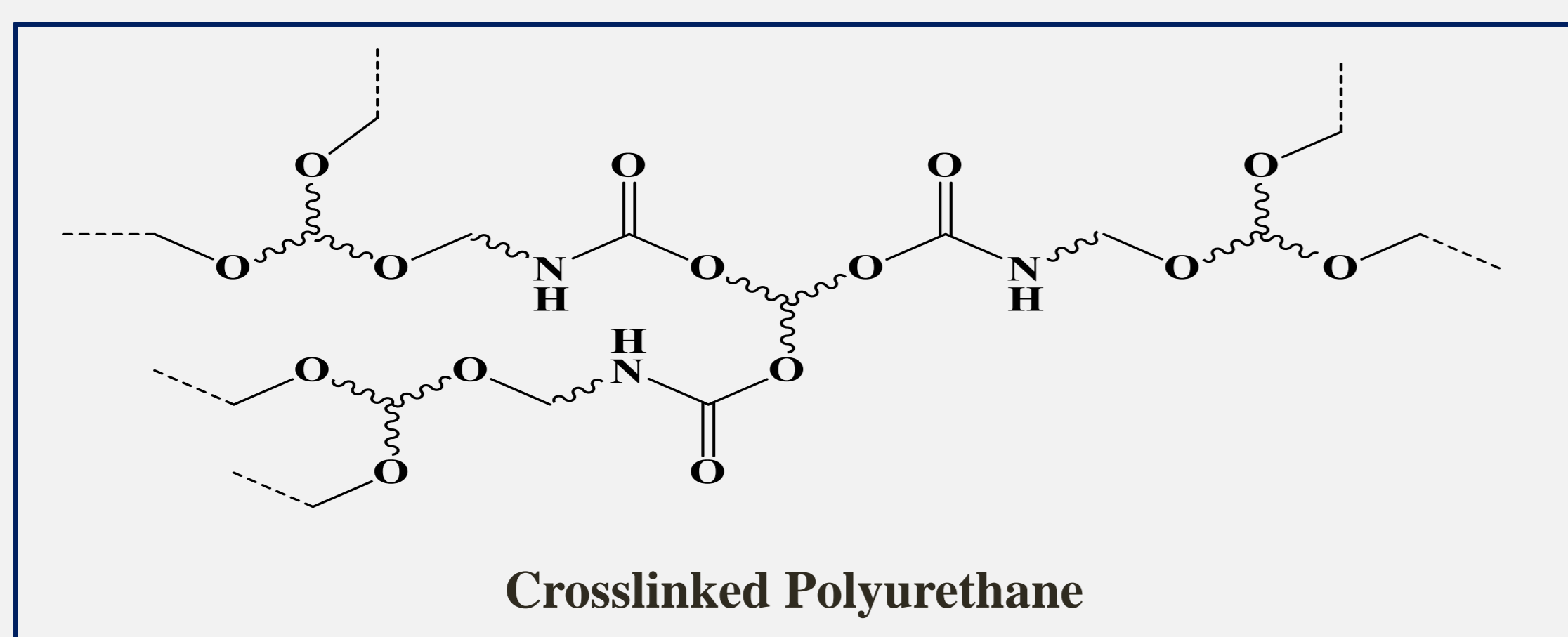
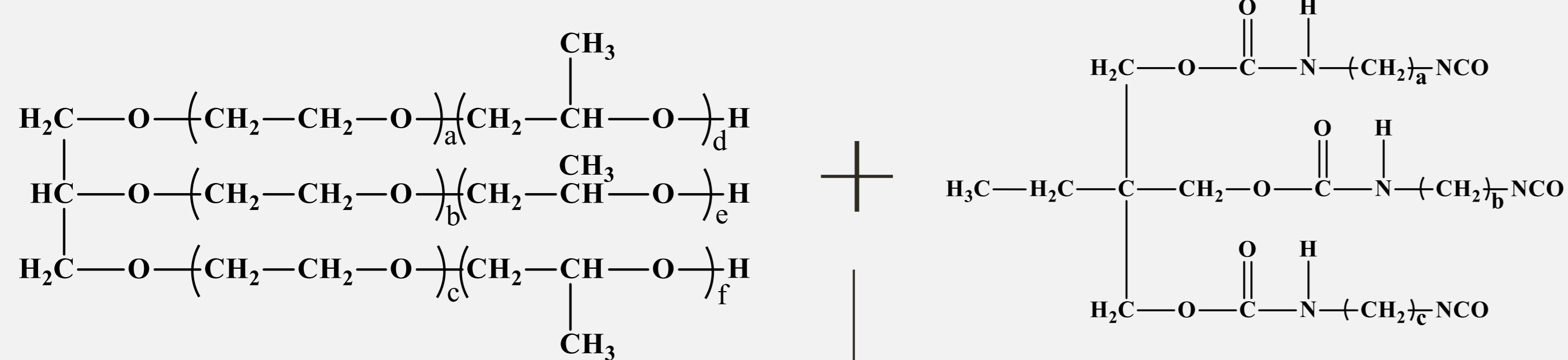
Polyurethane Pressure-sensitive Adhesives (PU-PSA) have been successfully synthesized using various polyols (PEG, PPG etc.) and isocyanates (HDI, IPDI etc.) to control adhesion with no residue left. In this study, to develop a polyurethane adhesive with better adhesive strength, urethane synthesis research was conducted by changing the ratio of polyol. The presence or absence of polyurethane adhesive synthesis through the ratio control of polyol and isocyanate was analyzed by Fourier-Transform Infrared Spectroscopy (FT-IR), and the characteristics of Polyurethane Pressure-sensitive Adhesives (PU-PSA) were analyzed by using One hundred eighty-degree peel tests by universal testing machine (UTM) and UV-vis Spectrometer to compare structure and characteristics.

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



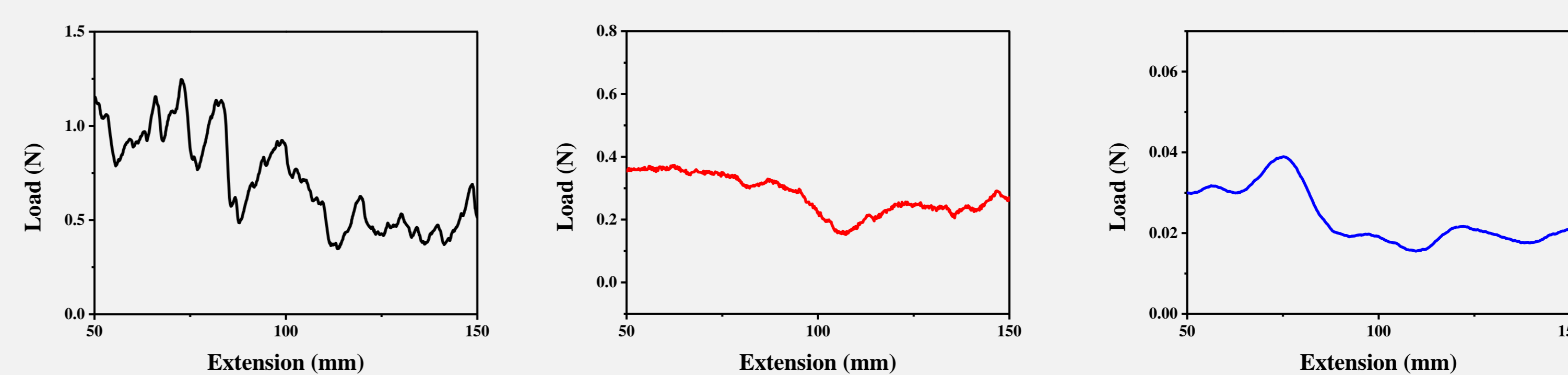
(unit: mole)	Base Polyurethane			Crosslinker		
functional group	3	2	2	2	2	3
Sample	Polyol 1	Isocyanate 1	Polyol 2	Polyol 3	Isocyanate 2	Isocyanate 3
#1	30	25	1		7.2	2.4
#2	30	25	1		21.6	2.4
#3	30	25		1	21.6	2.4

Results

After 180° Peel Test



UTM 180° Peel Test

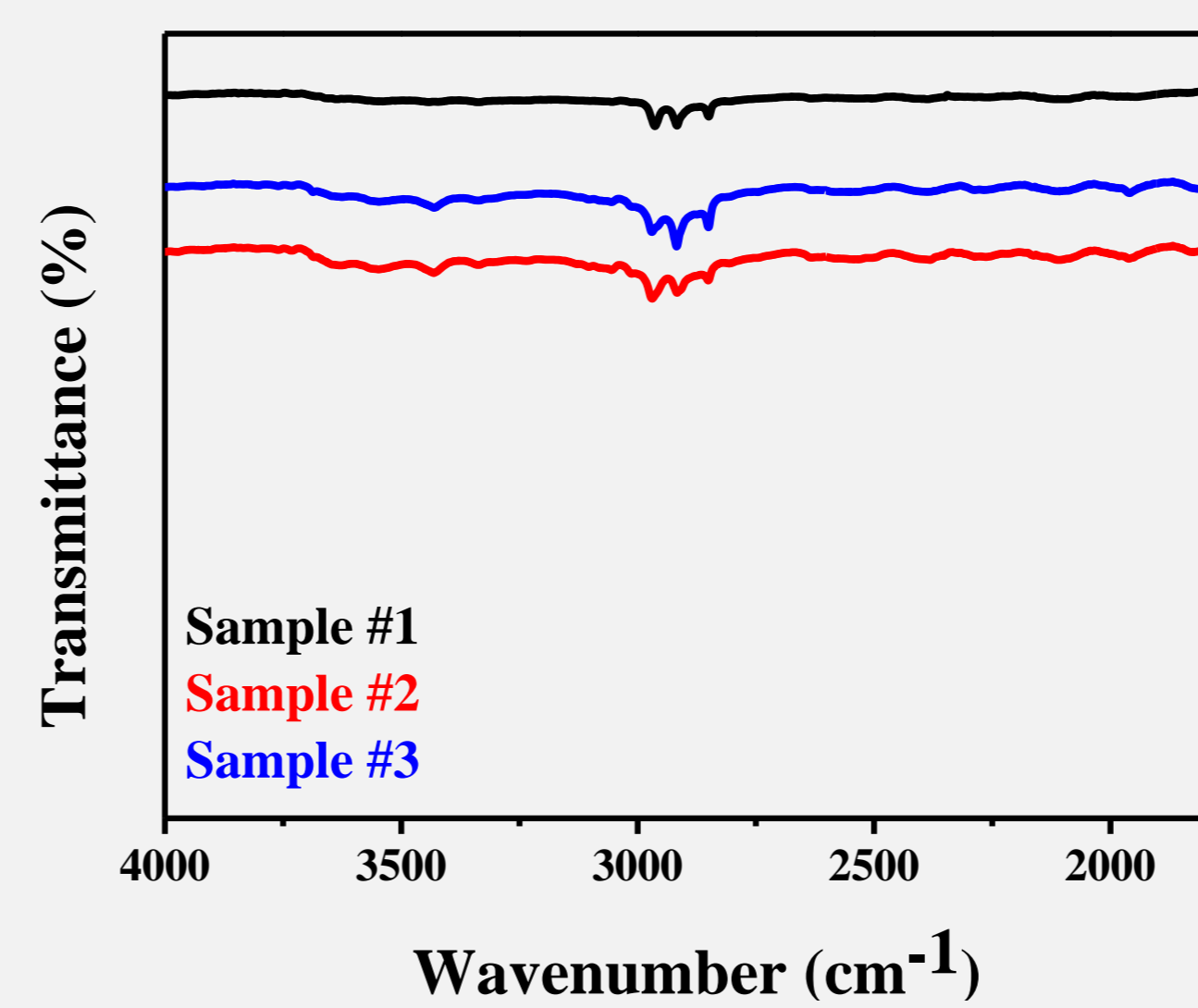


Sample #1	Load(N)
Maximum	1.246
Average	0.717

Sample #2	Load(N)
Maximum	0.372
Average	0.279

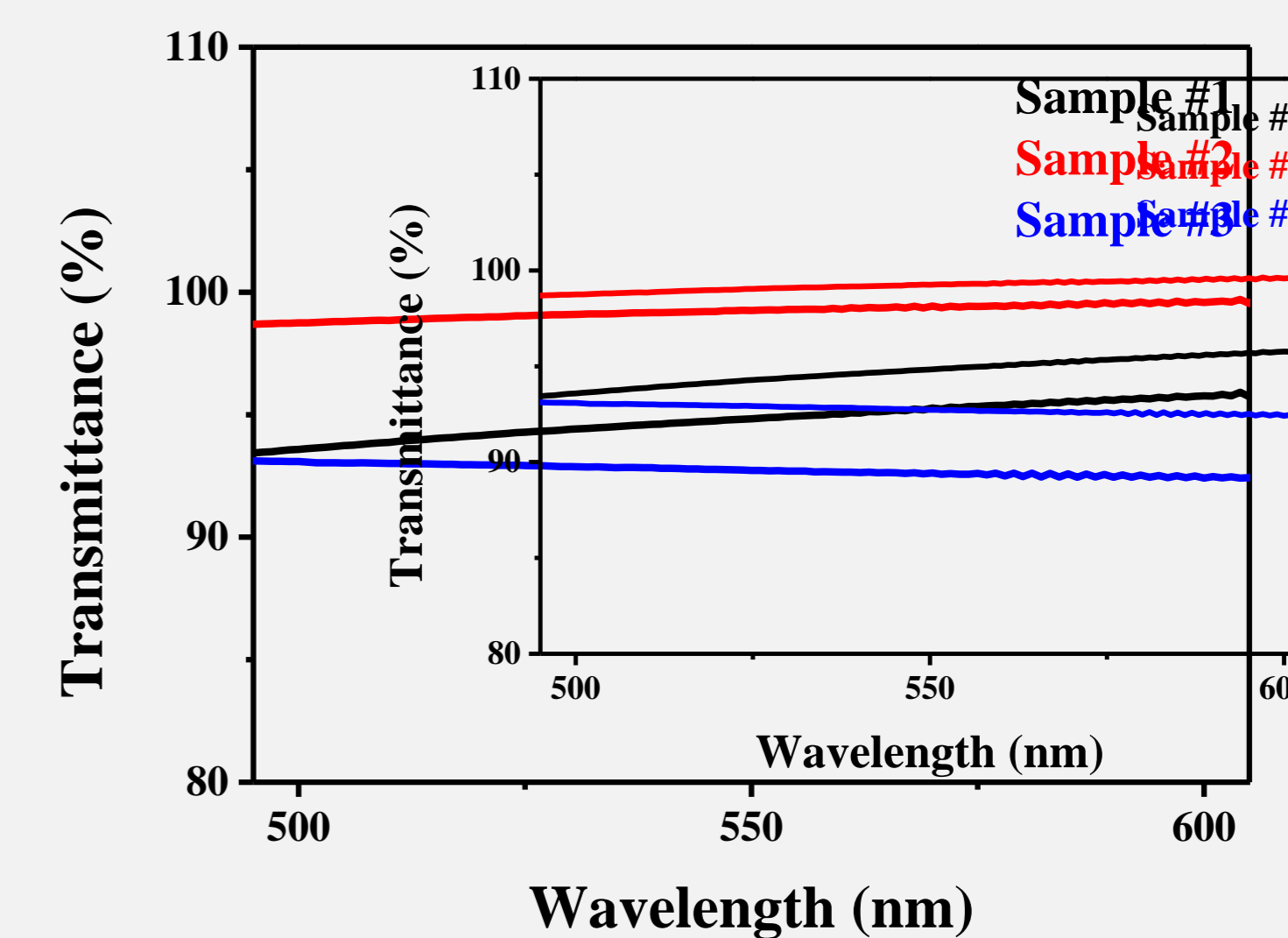
Sample #1	Load(N)
Maximum	0.046
Average	0.024

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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