Table S1. Designation and formulation of the CO-BPU samples.

Table S2. Designation and formulation of the ISO-BPU samples.

Table S3. Designation and formulation of the APTES-BPU samples.

Table S4. Fitting quality parameters (R^2) for the deconvolution of C=O stretching vibration region in FTIR spectra of all samples.

Table S5. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of CO-BPU.

Table S6. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of ISO-BPU.

Table S7. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of APTES-BPU.

Table S8. FTIR Phase Separation Table of the Prepared Bio-based Polyurethane in the Wavenumber Range of 1760–1600 cm^{-1}.

Table S9. Normalized Performance Comparison of the Samples Relative to CO-BPU

Table S1. Designation and formulation of the CO-BPU samples.

Samples	CO(g)	PCL(g)	ISO(g)	IPDI(g)	HT(g)	APTES(g)
CO-BPU	3	3	0	2.6	0	0

Table S2. Designation and formulation of the ISO-BPU samples.

Samples	CO(g)	PCL(g)	ISO(g)	IPDI(g)	HT(g)	APTES(g)
ISO-BPU-1	3	3	0.2	3	0.6	0
ISO-BPU-2	3	3	0.45	3.46	0.6	0
ISO-BPU-3	3	3	0.9	4.34	0.6	0
ISO-BPU-4	3	3	1.35	5.21	0.6	0

Table S3. Designation and formulation of the APTES-BPU samples.

Samples	CO(g)	PCL(g)	ISO(g)	IPDI(g)	HT(g)	APTES(g)
APTES-BPU-1	3	3	0.45	3.54	0.6	0.11

APTES-BPU-2	3	3	0.45	3.76	0.6	0.44
APTES-BPU-3	3	3	0.45	4.05	0.6	0.89
APTES-BPU-4	3	3	0.45	4.34	0.6	1.34

Table S4. Fitting quality parameters (R^2) for the deconvolution of C=O stretching vibration region in FTIR spectra of all samples.

Quality Parameters	**CO-BPU**	**ISO-BPU**				**APTES-BPU**			
		1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
R^2	0.979	0.997	0.989	0.990	0.985	0.999	0.987	0.984	0.999

Table S5. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of CO-BPU.

Assignment		**Subpeak**	**Wavenumber(cm^{-1})**	**Area(%)**
υ(C=O) urea amide	**H-bonded (Ordered)**	**I**	1648	24.0
	Free	**II**	1699	32.8
υ(C=O) ester urethane amide	**Free**	**III**	1730	43.2
	Total degree of H-bonded			24.0

Table S6. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of ISO-BPU.

Assignment		Subpeak	Wavenumber(cm^{-1}) ISO				Area(%) ISO			
			1	2	3	4	1	2	3	4
υ(C=O) urea amide	H-bonded (Ordered)	I	1633	1633	1633	1631	8.6	9.0	6.2	7.5
	H-bonded (Disordered)	II	1663	1662	1667	1660	19.8	24.2	32.2	27.3
	Free	III	1698	1694	1699	1692	22.4	20.2	21.7	20.7
υ(C=O) ester urethane amide	H-bonded (Ordered)	IV	1723	1718	1720	1713	38.4	33.9	26.9	29.2
	Free	V	1736	1737	1732	1733	10.8	12.6	13.0	15.3
Total degree of H-bonded							66.8	67.1	65.3	64.0

Table S7. Summary of the Assignments of Deconvoluted Subpeaks for the C=O Stretching Vibration Absorption Band in the FTIR Spectrum of APTES-BPU.

Assignment		Subpeak	Wavenumber(cm^{-1}) APTES				Area(%) APTES			
			1	2	3	4	1	2	3	4
υ(C=O) urea amide	H-bonded (Ordered)	I	1634	1639	1633	1631	6.1	11.9	13.6	9.1
	H-bonded (Disordered)	II	1668	1666	1669	1667	24.5	22.6	17.3	22.3
	Free	III	1694	1695	1693	1690	13.3	9.1	10.1	13.6
υ(C=O) ester urethane amide	H-bonded (Disordered)	IV	1705	1701	1706	1702	5.4	26.5	7.9	8.0
	H-bonded (Ordered)	V	1723	1725	1721	1721	44.5	23.1	35.7	32.8
	Free	VI	1739	1736	1735	1735	6.2	6.7	15.4	14.3
Total degree of H-bonded							80.5	84.1	74.5	72.2

Table S8. FTIR Phase Separation Table of the Prepared Bio-based Polyurethane in the Wavenumber Range of 1760–1600 cm^{-1}.

Symbol	A_b(%)	A_f(%)	R	DPS(%)	DPM(%)
CO-BPU	24.0	76.0	0.32	24.0	76.0
ISO-BPU-1	66.8	33.2	2.01	66.8	33.2
ISO-BPU-2	67.1	32.9	2.04	67.1	32.9
ISO-BPU-3	65.3	34.7	1.88	65.3	34.7
ISO-BPU-4	64.0	36.2	1.78	64.0	36.0
APTES-BPU-1	80.5	19.5	4.13	80.5	19.5
APTES-BPU-2	84.1	15.9	5.29	84.1	15.9
APTES-BPU-3	74.5	25.5	2.92	74.5	25.5
APTES-BPU-4	72.2	27.8	2.60	72.2	27.8

Table S9. Normalized Performance Comparison of the Samples Relative to CO-BPU

	CO-BPU	ISO-BPU-2	APTES-BPU-2
Thermal Stability (°C)	1	1.01	1.02
Mechanical Strength (MPa)	1	3.11	7.02
Acidic Degradation (h)	1	2.74	2.87
Alkaline Degradation(h)	1	2.5	3.45