

Supporting Information

Structural engineering of waterborne polyurethane for high performance waterproof coatings

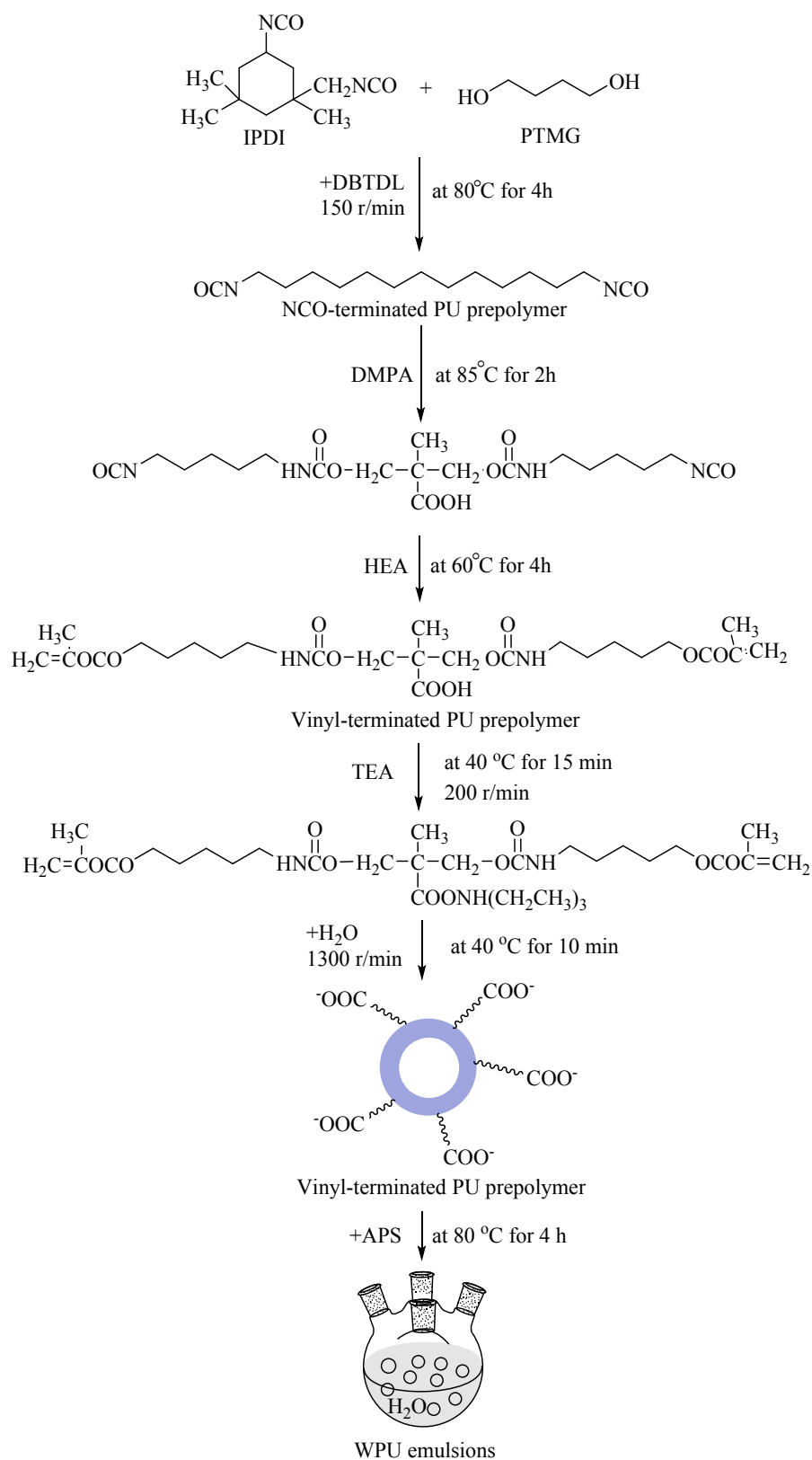
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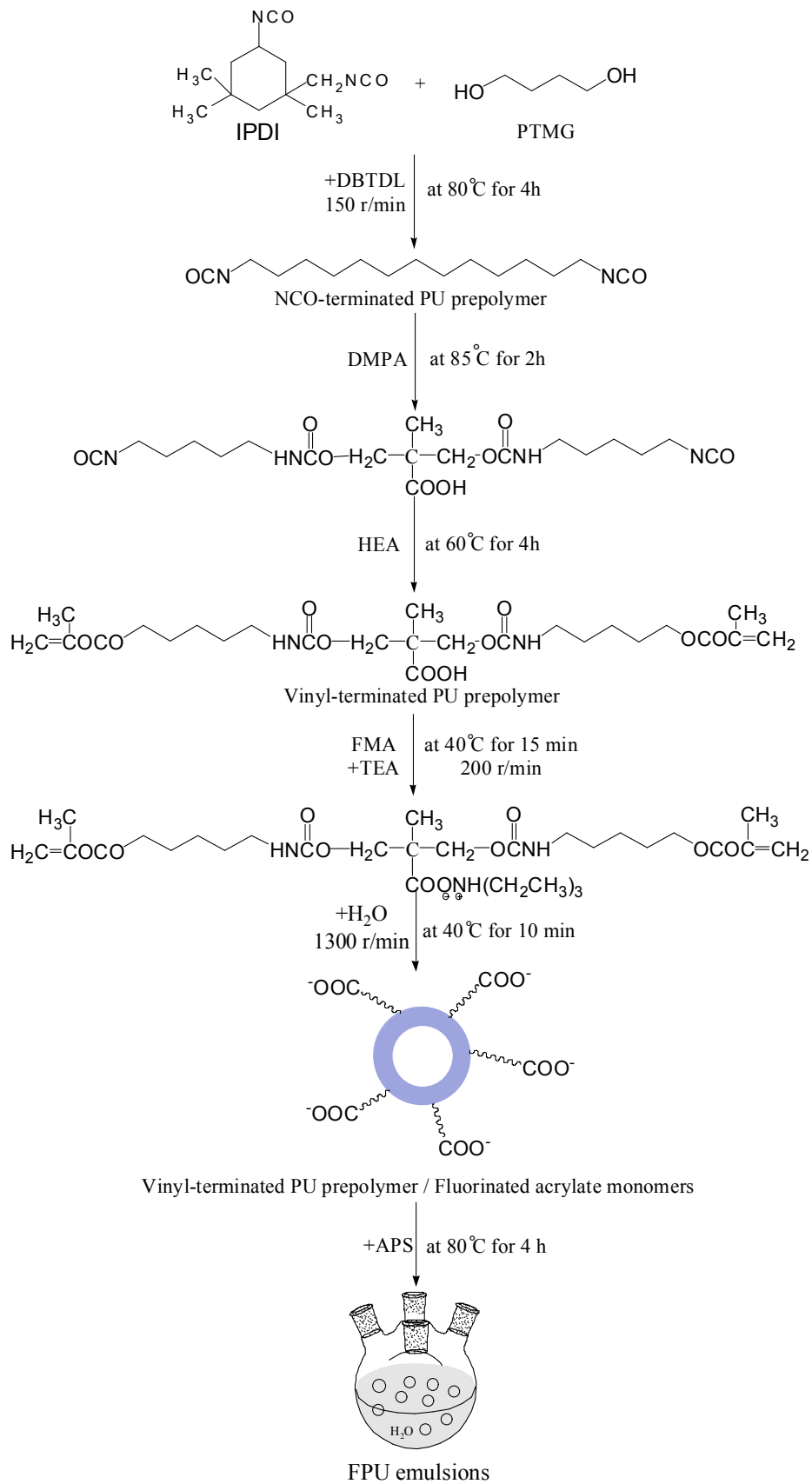
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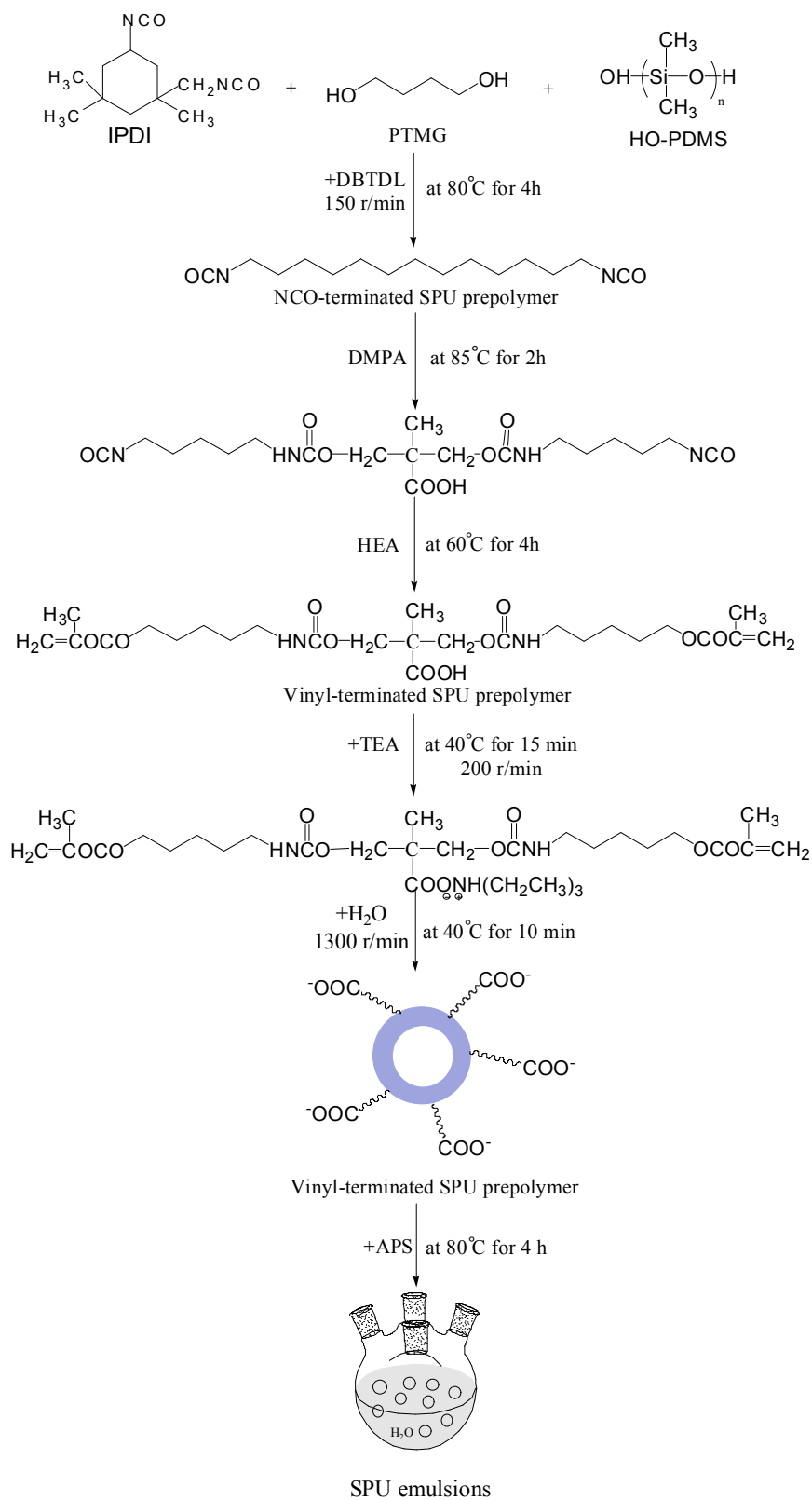
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Scheme S1 The preparation of WPU emulsions



Scheme S2 The preparation of FPU emulsions



Scheme S3 The preparation of SPU emulsions

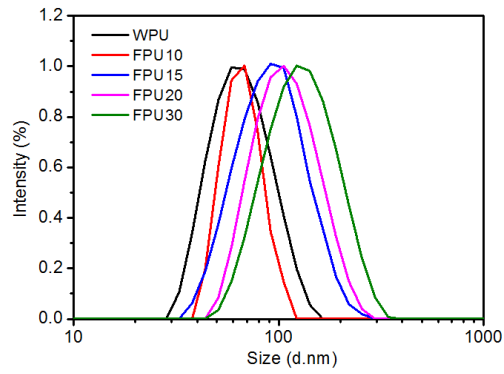


Figure S1 Particle sizes and distributions of FPU dispersions

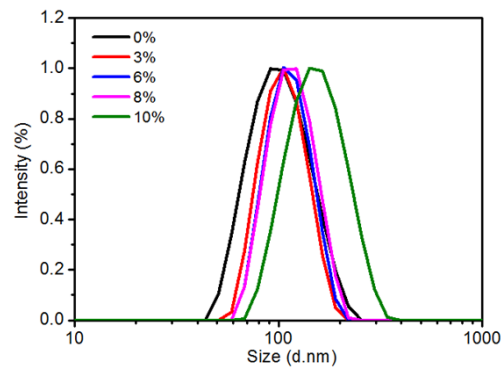


Figure S2 Particle sizes and distributions of SPU dispersions

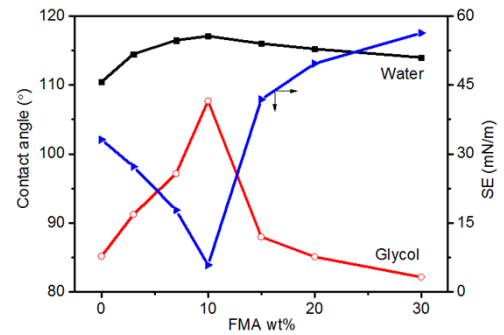


Figure S3 Surface energies of FPU hybrid films

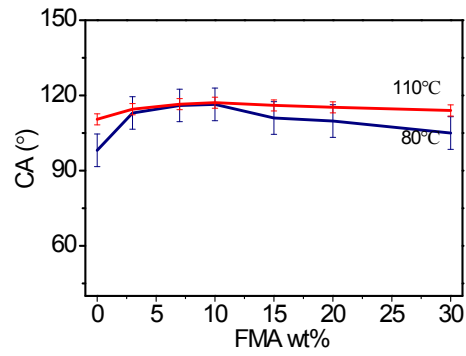


Figure S4 Water contact angles of different FPU

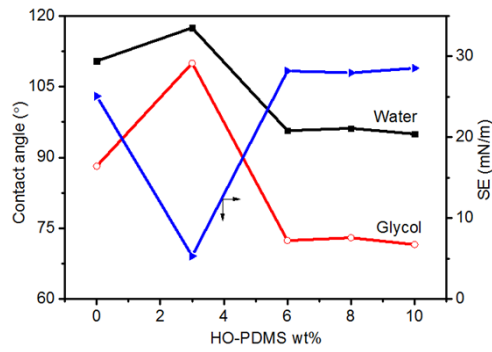


Figure S5 Surface energies of SPU hybrid films

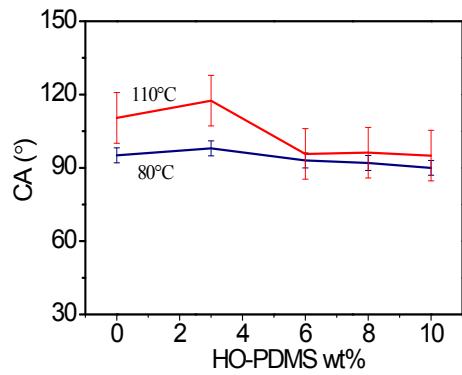


Figure S6 Water contact angles of SPU hybrid films

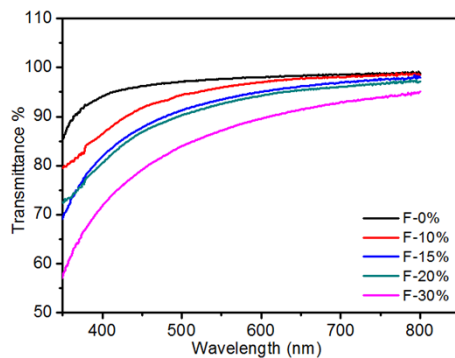


Figure S7 UV-vis curves of different FPUs

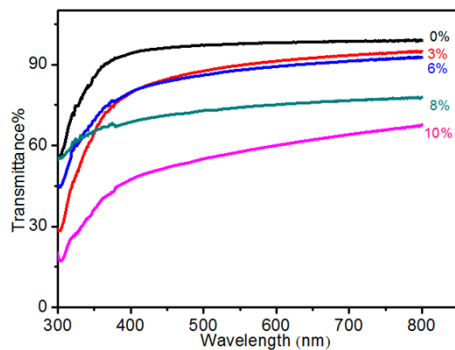


Figure S8 UV-vis curves of different SPUs

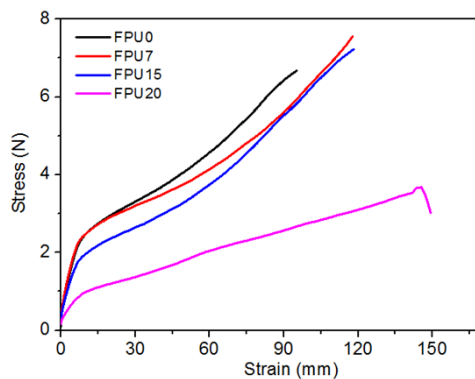


Figure S9 Strain-stress curves of different FPUs

Table S1 UTM results and solvent absorptions of FPU hybrid films

Sample	Mechanical properties			Solvent absorption	
	Modulus (MPa)	Tensile strength (MPa)	Elongation at break (%)	Water (%)	N-heptane (%)
WPU	0.36	2.34	246.6	39	17.1
FPU10	0.31	1.71	307.1	38	13.3
FPU15	0.24	1.44	395.4	32.2	11.1
FPU20	0.2	1.12	468.6	43.9	20.2
FPU30	-	-	-	-	-

- No test results

Table S2 UTM results and solvent absorptions of SPU hybrid films

Sample	Mechanical properties			Solvent absorption	
	Modulus (MPa)	Tensile strength (MPa)	Elongation at break (%)	Water (%)	N-heptane (%)
SPU3	0.19	2.1	265.2	33.5	29.1
SPU6	0.15	1.8	337.9	20	17.1
SPU8	0.11	1.7	451.6	19.2	16.9
SPU10	0.1	1.03	578.3	44.4	74.9

Table S3 Viscosities, average particle sizes, contact angles and storage stabilities of FPU hybrid emulsions

Sample	Viscosity (Pa·s) ^a	Average particle size	Contact angle ^b	Film stability (110°C)	Storage stability ^c
WPU	0.87	73.67	111.05	yellow	Stable
FPU3	0.69	84	118.64	yellow	Stable
FPU15	0.61	107	117.97	yellow	Stable
FPU20	0.46	113	119.46	yellow	Stable
FPU30	0.11	123.6	113.5	yellow	Unstable

^a The viscosity of $\gamma=10$.

^b The max CA of film was dried at 110°C.

^c The storage stability after 3 months.

Table S4 Viscosities, average particle sizes, contact angles and storage stabilities of SPU hybrid emulsions

Sample	Viscosity (Pa·s) ^a	Average particle size	Contact angle ^b	Film stability (110°C)	Storage stability ^c
SPU3	0.69	102.4	124.44	colorless	Stable
SPU6	0.57	109.2	116.98	colorless	Stable
SPU8	0.33	111.6	100.01	colorless	Unstable
SPU10	0.21	145	99	colorless	Unstable

^a The viscosity of $\gamma=10$.

^b The max contact angle of film was dried at 110°C.

^c The storage stability after 3 months.