

Supporting information

The multi-step chain extension for waterborne polyurethane binder of *para*-aramid fabrics

Table S1 Relative contributions of free, ordered and disordered H-bonded C=O in WPU.

Sample	Peak 1	Peak 2	Peak 3
	ordered	disordered	free
WPU-G	27	28	45
3D ₁ -G	31	44	25
3D ₂ -G	29	46	25
3D ₃ -G	39	26	35
3D ₄ -G	32	41	27
3D ₅ -G	31	46	23
3T ₂ -G	70	25	5
3P ₂ -G	65	20	15
1D ₂ -G	60	20	20
2D ₂ -G	63	21	16
3D ₂ -G ₈ L ₂	62	22	16
3D ₂ -G ₆ L ₄	48	32	20
3D ₂ -G ₄ L ₆	57	20	23
3D ₂ -G ₂ L ₈	58	27	15
3D ₂ -L	28	32	40

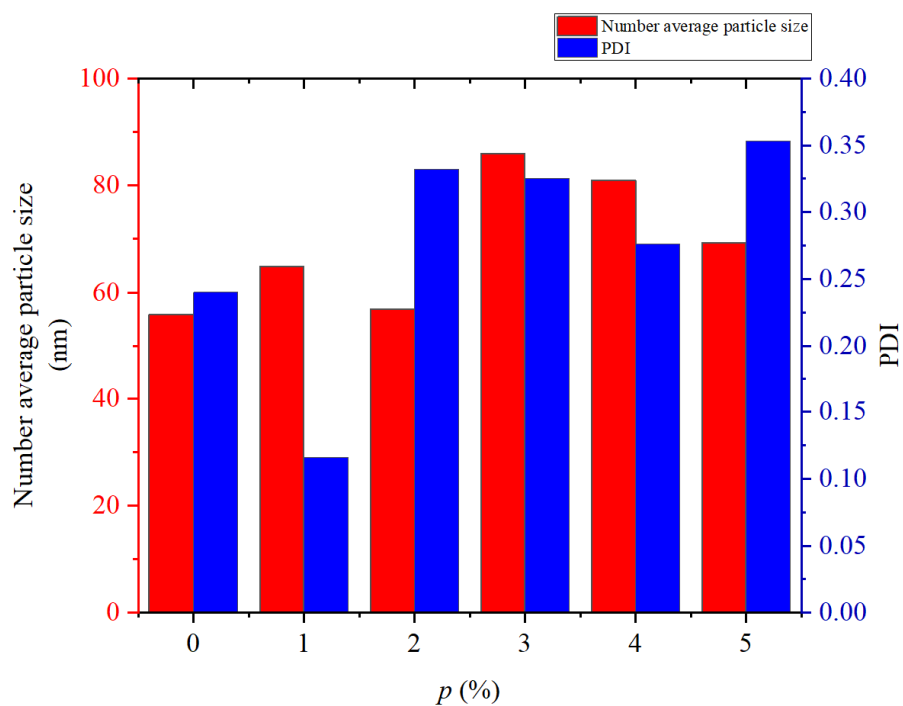


Figure S1. Effect of DMU content on the number-average particle size and PDI of WPU-G and 3D_p-G.

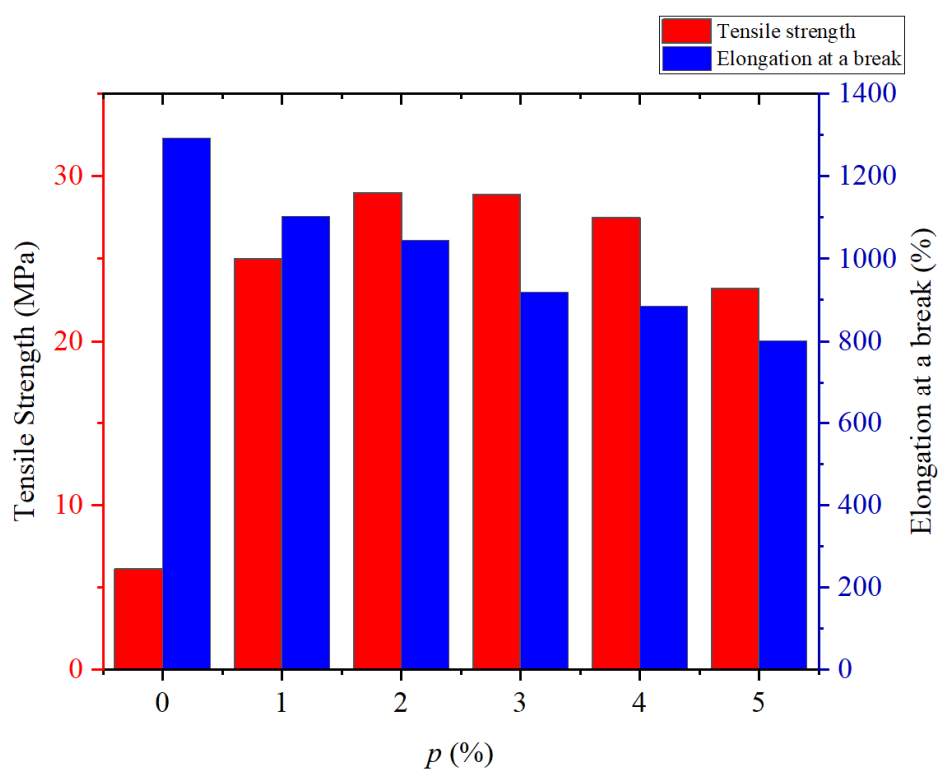


Figure S2. Effect of DMU content on tensile strength and elongation at break of WPU-G and 3D_p-G.

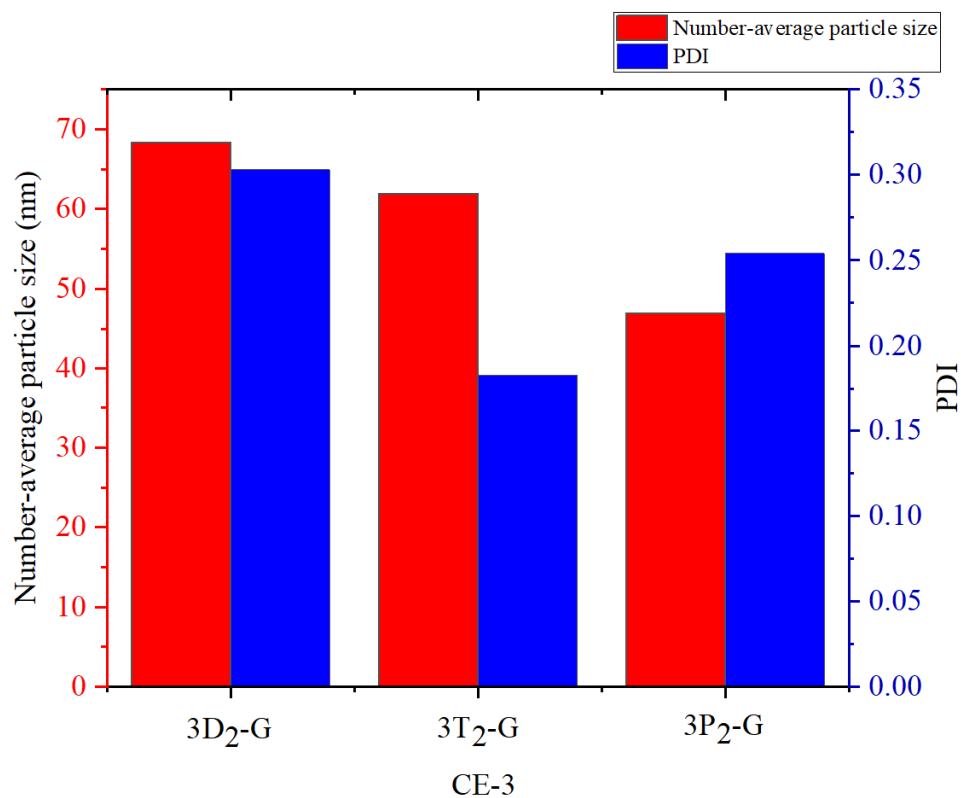


Figure S3. Number average particle size and PDI of 3D₂-G, 3T₂-G and 3P₂-G.

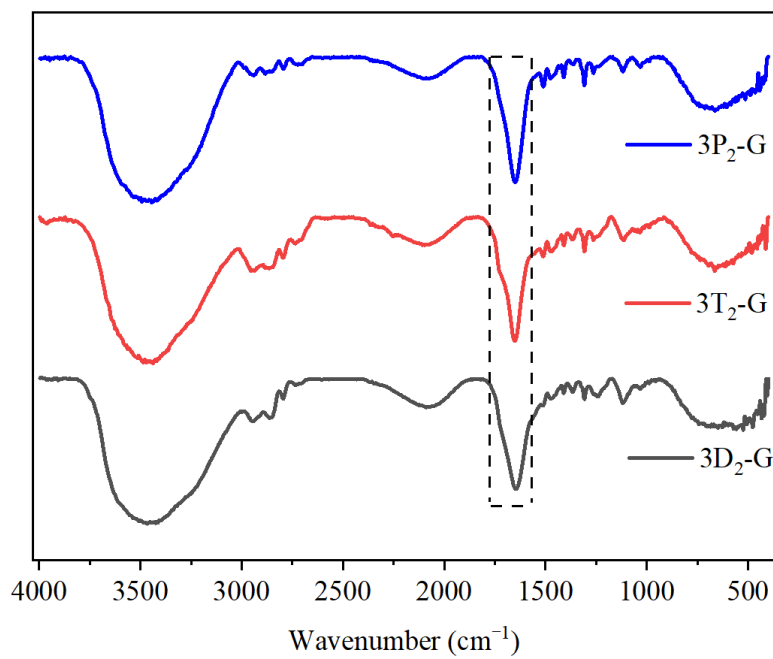


Figure S4. The FTIR spectra of 3D₂-G, 3T₂-G and 3P₂-G.

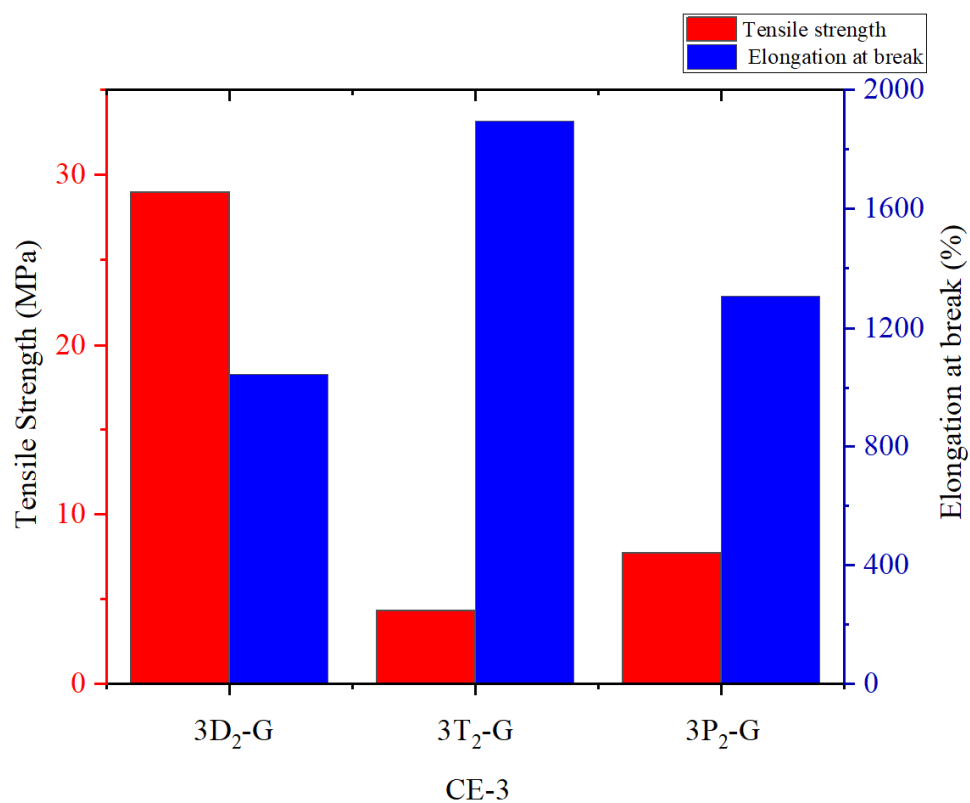


Figure S5. Tensile strength and the elongation at break of 3D₂-G, 3T₂-G and 3P₂-G.

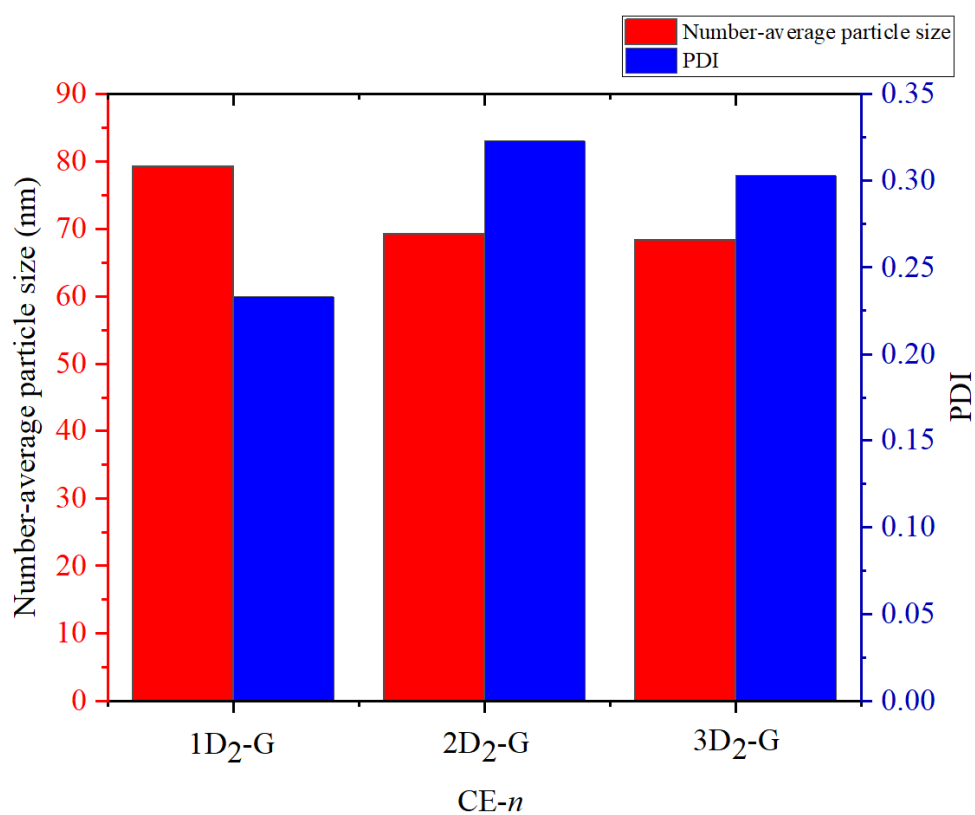


Figure S6. Number average particle size and PDI of 1D₂-G, 2D₂-G and 3D₂-G.

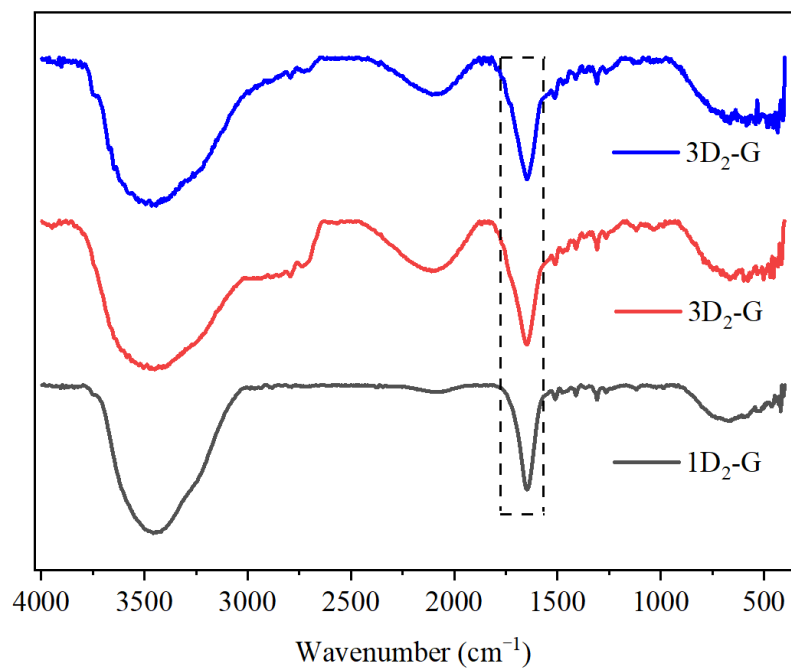


Figure S7. The FTIR spectra of 1D₂-G, 2D₂-G and 3D₂-G.

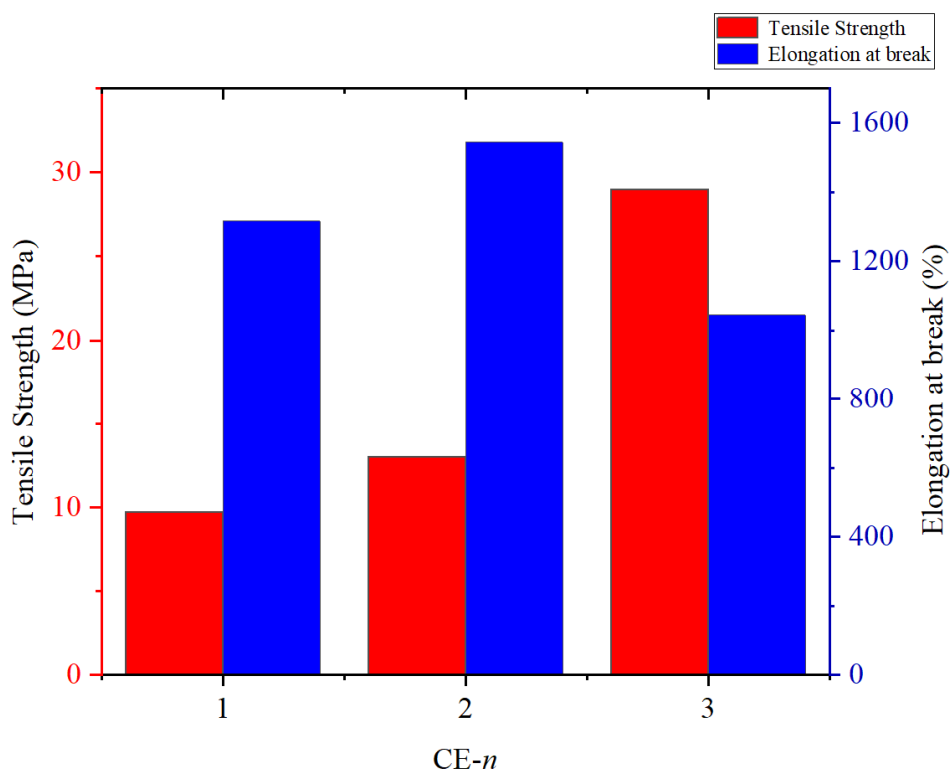


Figure S8. Tensile strength and the elongation at break of 1D₂-G, 2D₂-G and 3D₂-G.

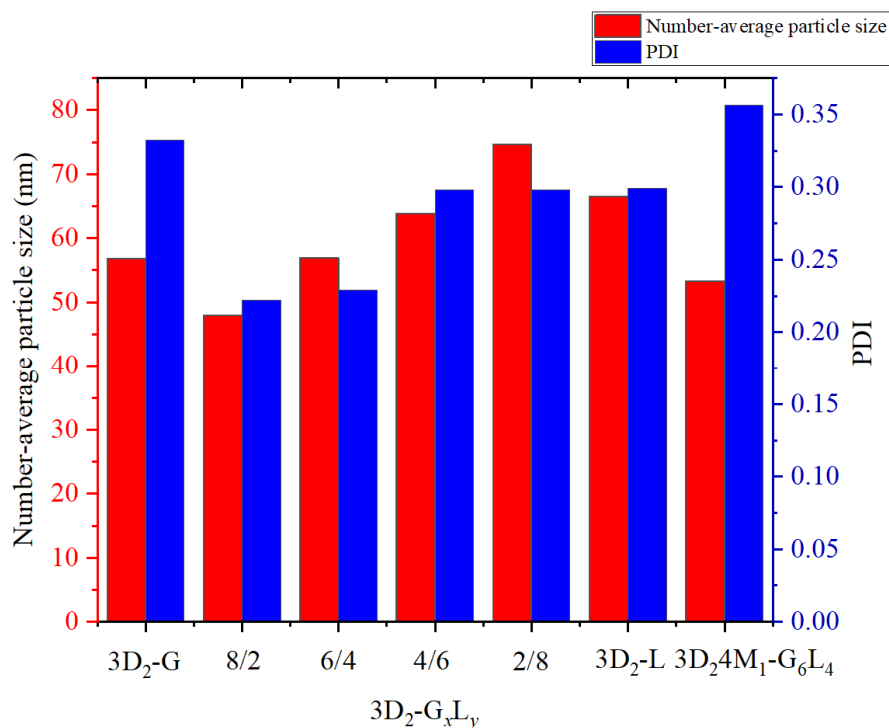


Figure S9. Effect of PTMG/PCL molar ratio (x/y) on number-average particle size and PDI of 3D₂-G _{x} L _{y} samples.(where x/y were 8/2, 6/4, 4/6, and 2/8, respectively. For comparison purposes , also summarizes the results for 3D₂-G and 3D₂-L.)

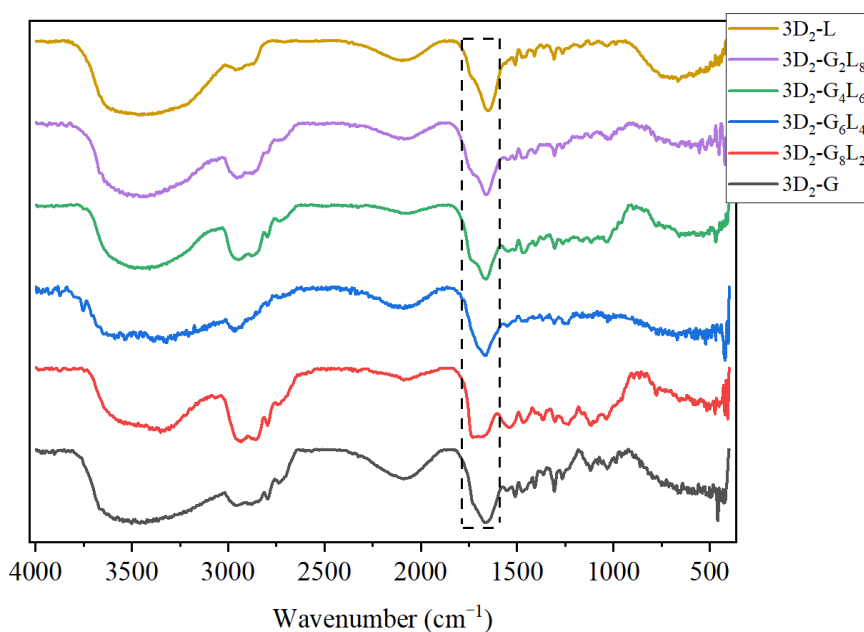


Figure S10. The FTIR spectra of 3D₂-G _{x} L _{y} samples.(where x/y were 8/2, 6/4, 4/6, and 2/8, respectively. For comparison purposes , also summarizes the results for 3D₂-G and 3D₂-L.)

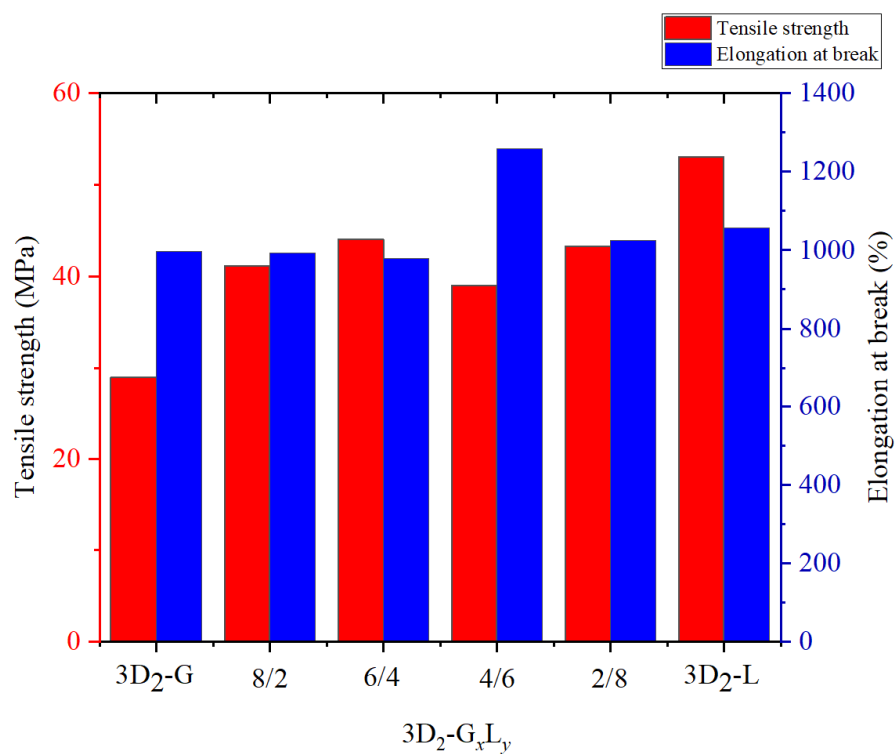


Figure S11. Tensile strength and the elongation at break of 3D₂-G_xL_y samples.(where x/y were 8/2, 6/4, 4/6, and 2/8, respectively. For comparison purposes , also summarizes the results for 3D₂-G and 3D₂-L.)