

Biocompatible waterborne polyurethane for bio-adhesive of wound closure

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Abstract

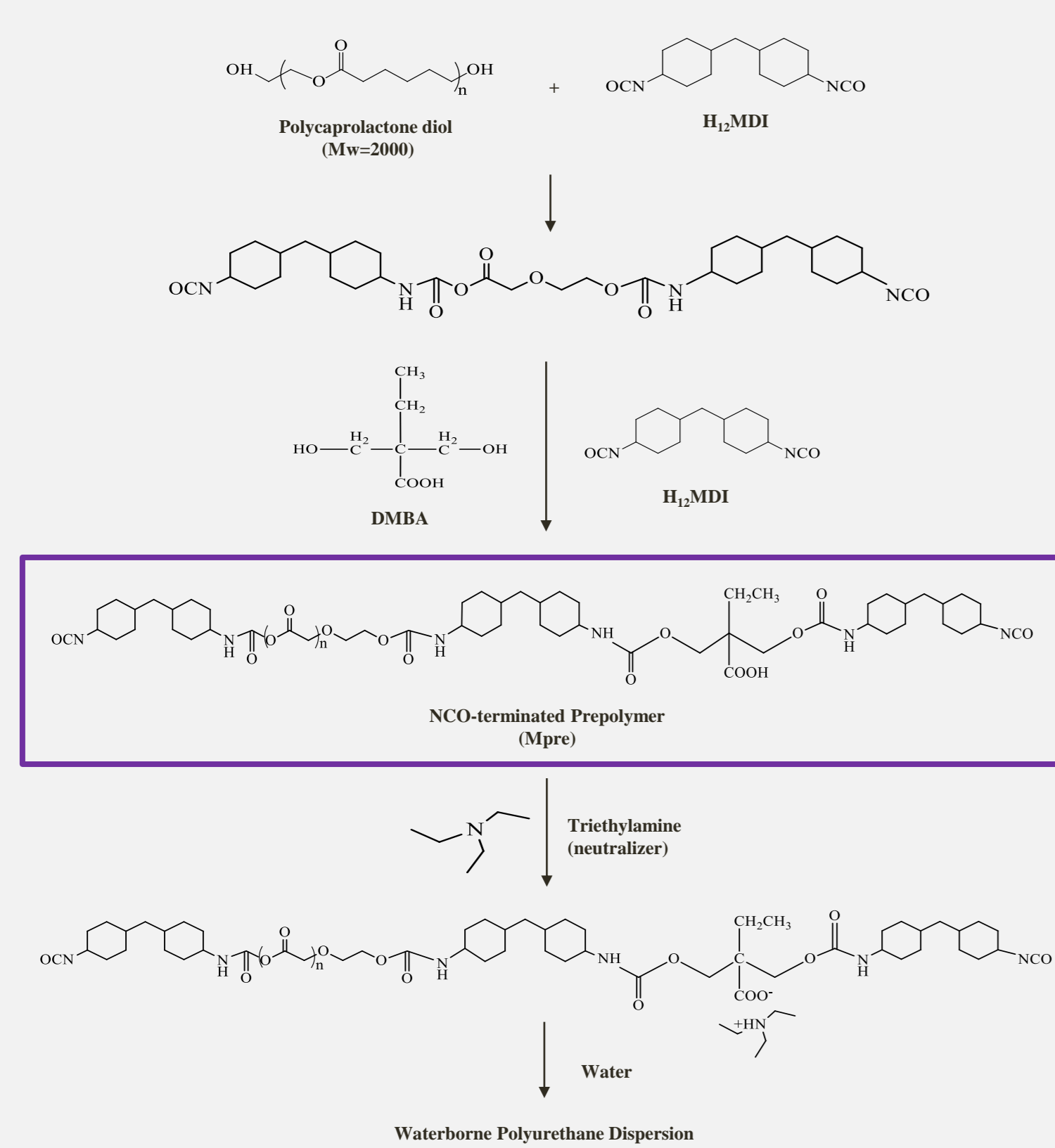
Biocompatible waterborne polyurethanes (B-WPUs) were successfully prepared using polycaprolactone diol (PCL) and 4,4'-Methylene dicyclohexyl diisocyanate (H12MDI) as soft segment of prepolymer, dimethylolbutanoic acid (DMBA) as emulsifier, and trimethylamine (TEA) as neutralizer, ethylenediamine (EDA) as chain extender based on different molecular weight of pre-polymer. Various properties to apply as bio-adhesives of wound closure were studied through FT-IR, DSC, TGA, contact-angle, and UTM. Biodegradation efficiencies by natural enzyme were also evaluated using degrading-enzyme systems, as a function of time. B-WPU could be considered as a promising candidate to be applied the various bio-fields where biodegradation is important.

Objective

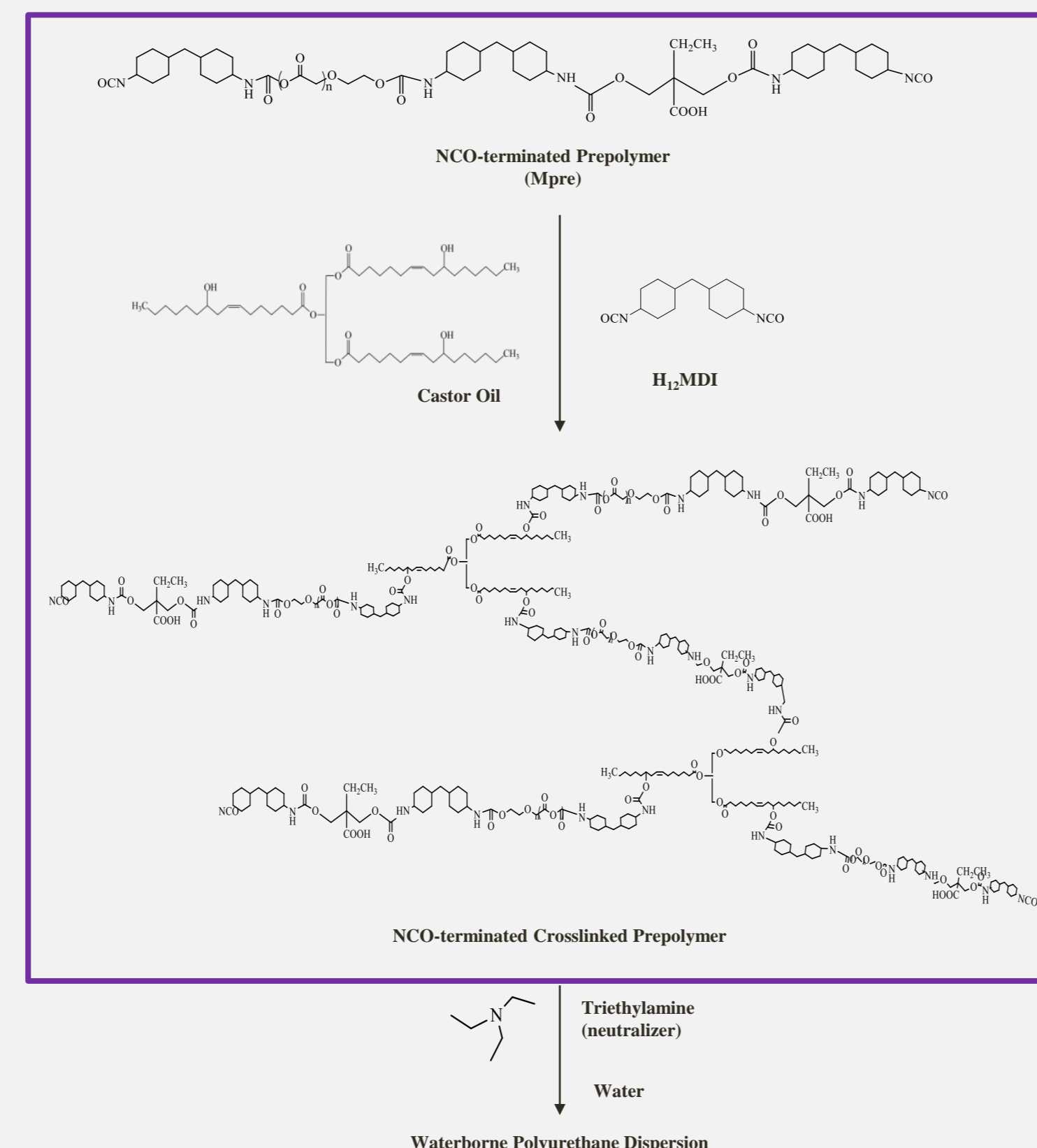
1. To synthesize the biocompatible waterborne polyurethanes (B-WPUs) through two-step processing
2. To evaluate the castor oil effect on the mechanical properties of B-WPUs
3. To investigate adhesion properties and the enzymatic biodegradability on the surface of aminated substrate

Experimental

Scheme 1



Scheme 2



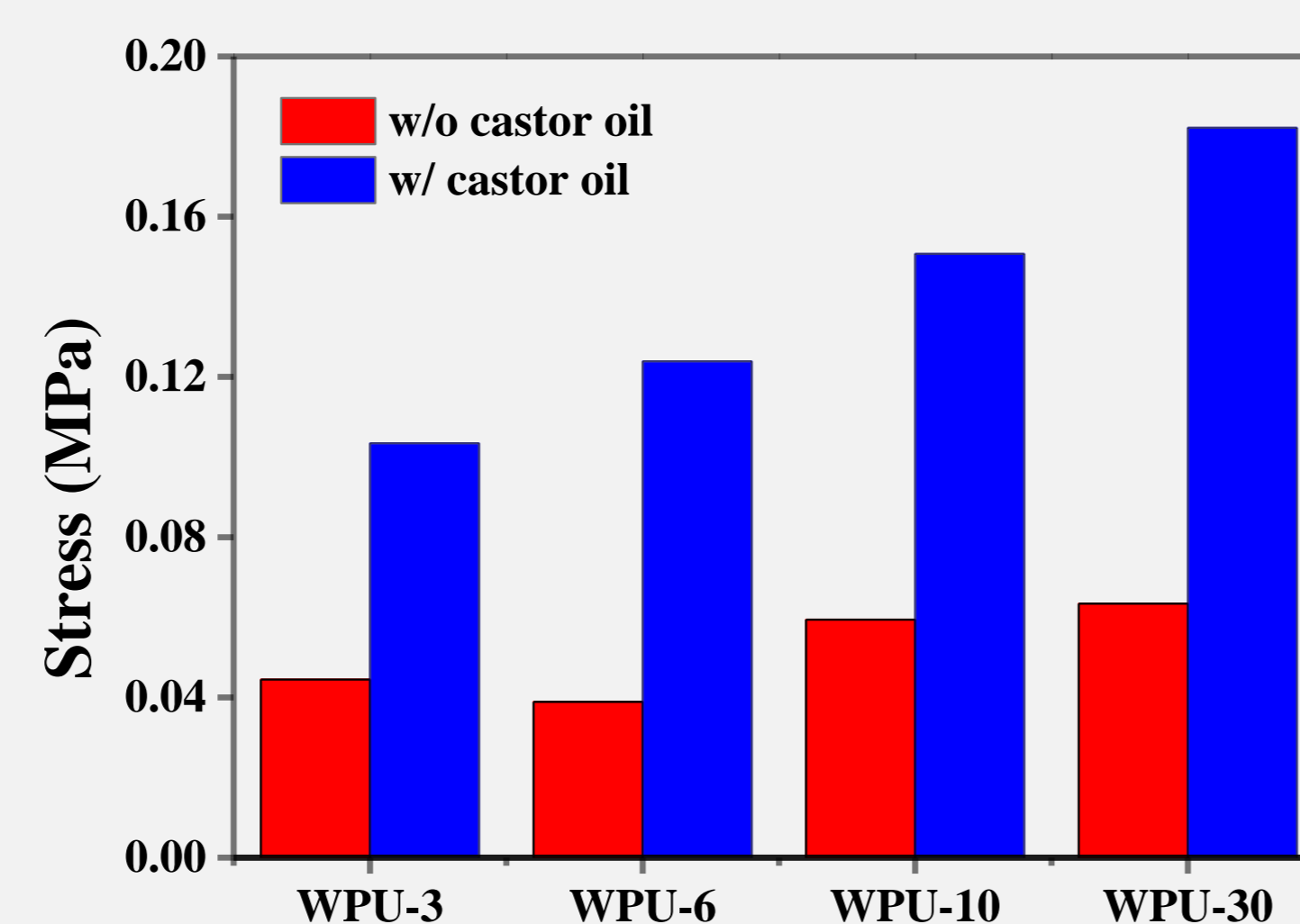
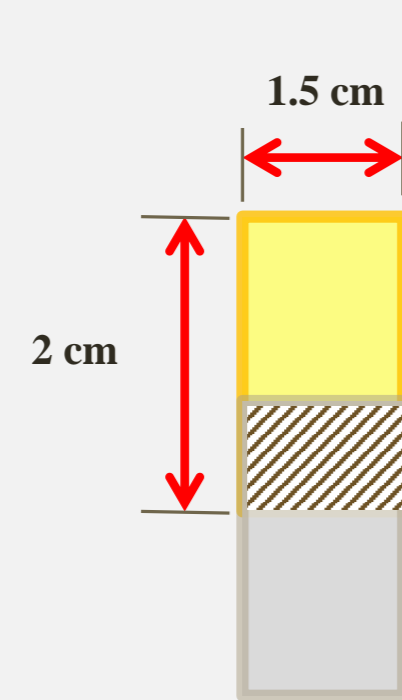
Formulation

	Mpre	Series	Soft segment		Ionic group		Castor Oil		TEA
			PCL(530)	H ₁₂ MDI	DMBA	H ₁₂ MDI	Castor Oil	H ₁₂ MDI	
#1	3000	WPU-3	0.0293	0.0393	0.0101	0.0101	-	-	0.0101
#2		WPU-3C	0.0293	0.0393	0.0101	0.0101	0.0050	0.0050	0.0101
#3	6000	WPU-6	0.0310	0.0360	0.0101	0.0101	-	-	0.0101
#4		WPU-6C	0.0310	0.0360	0.0101	0.0101	0.0025	0.0025	0.0101
#5	10000	WPU-10	0.0316	0.0346	0.0101	0.0101	-	-	0.0101
#6		WPU-10C	0.0316	0.0346	0.0101	0.0101	0.0015	0.0015	0.0101
#7	30000	WPU-30	0.0323	0.0333	0.0101	0.0101	-	-	0.0101
#8		WPU-30C	0.0323	0.0333	0.0101	0.0101	0.0005	0.0005	0.0101

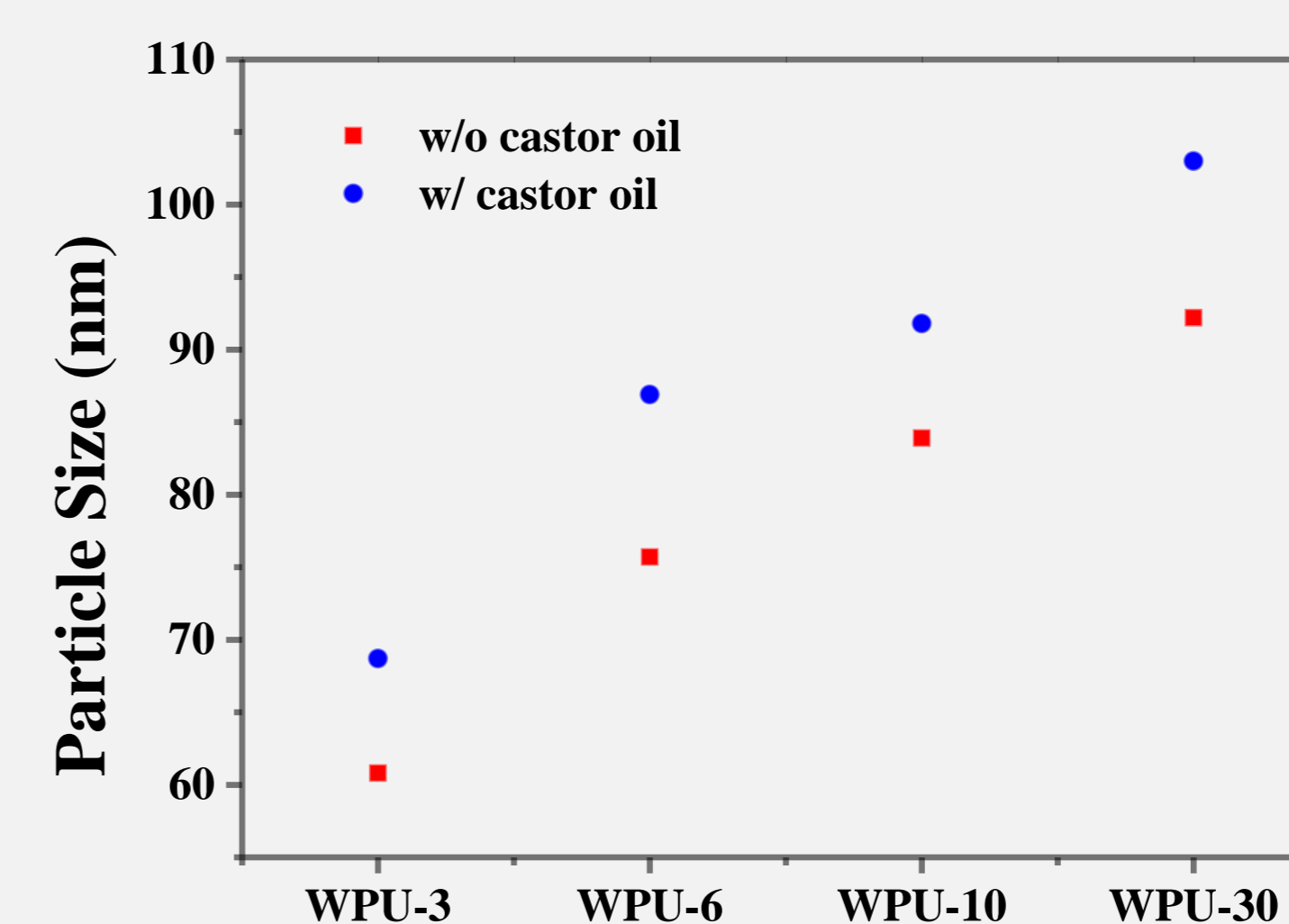
Solid:30g, Ionic group:5wt%

Results

Adhesion Tests of B-WPUs



Particle Size of B-WPUs



Conclusion

- A molecular weight series of Castor oil-based B-WPU were successfully controlled
- Mechanical properties can be adjusted to suit particular wound closure

Acknowledgement

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