

# 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 (H<sub>12</sub>MDI) 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

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

## Experimental

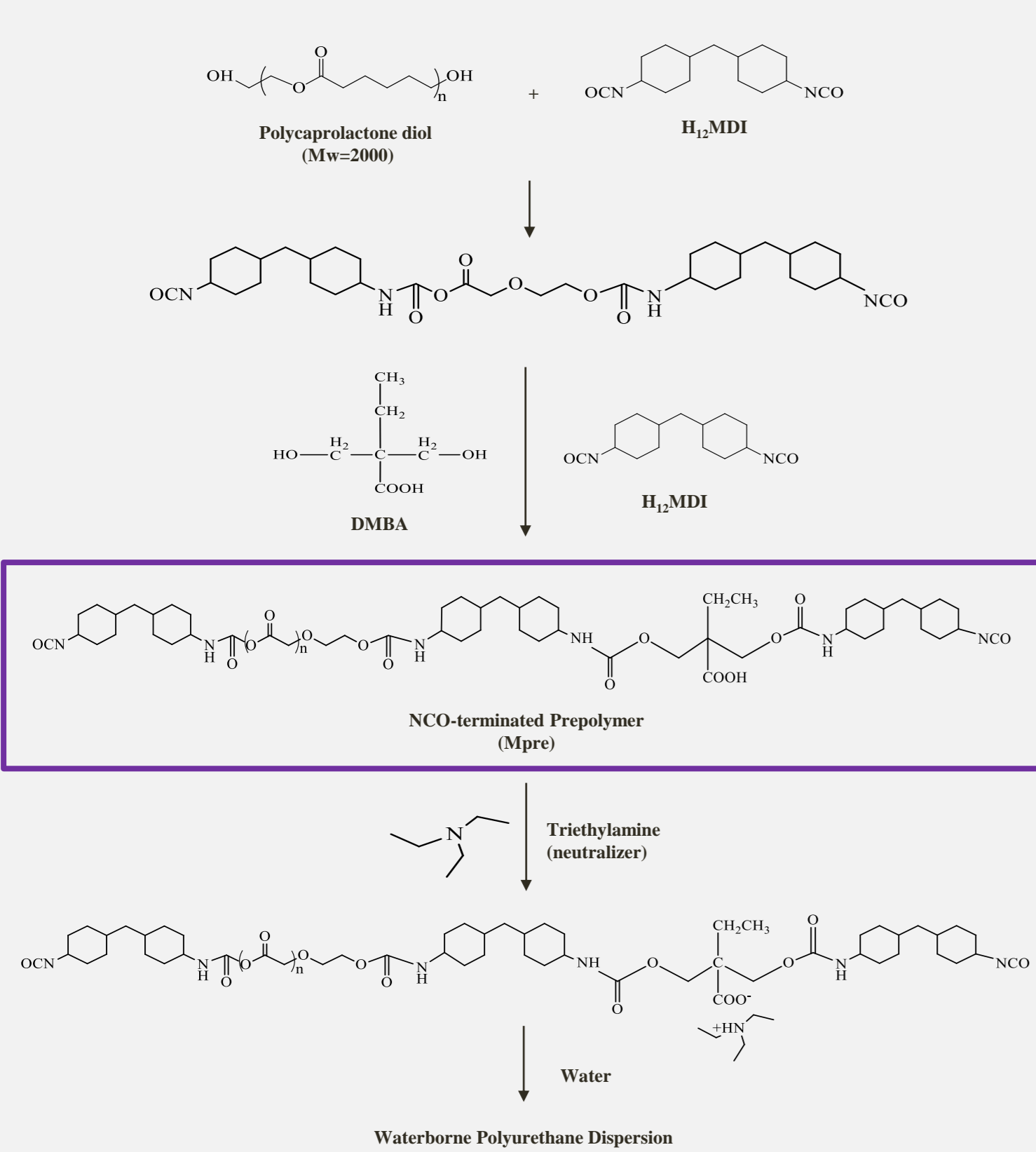
### Formulation

(unit:mol)

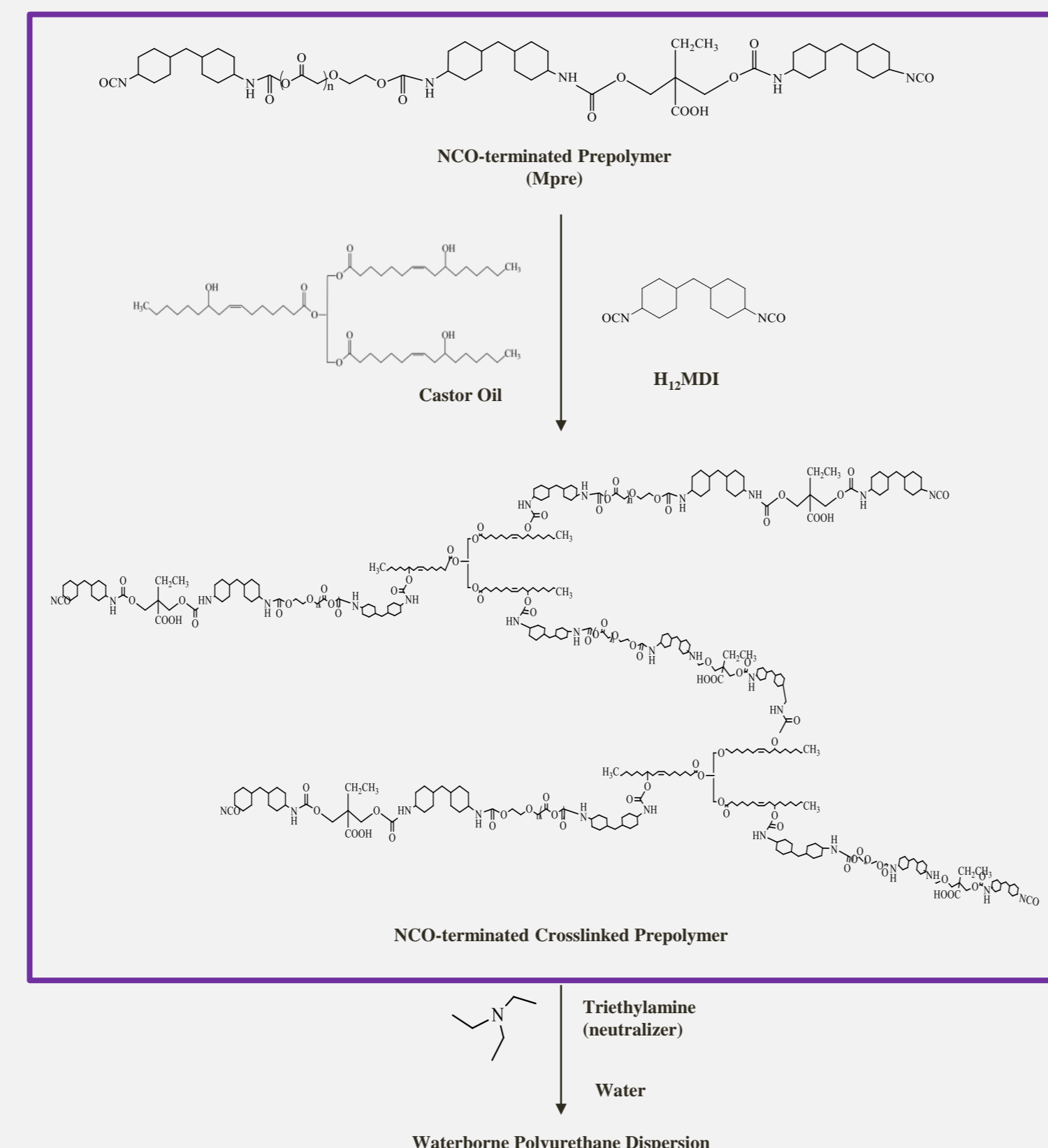
	Mpre	Series	Soft segment		Ionic group		Castor Oil		TEA
			PCL(530)	H <sub>12</sub> MDI	DMBA	H <sub>12</sub> MDI	Castor Oil	H <sub>12</sub> MDI	
#1	3000	WPU-3	0.0293	0.0393	0.0101	0.0101	-	-	0.0101
#2		WPU-3C	0.0293	0.0393	0.0101	0.0101	0.0050	0.0050	0.0101
#3	6000	WPU-6	0.0310	0.0360	0.0101	0.0101	-	-	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%

### Scheme 1

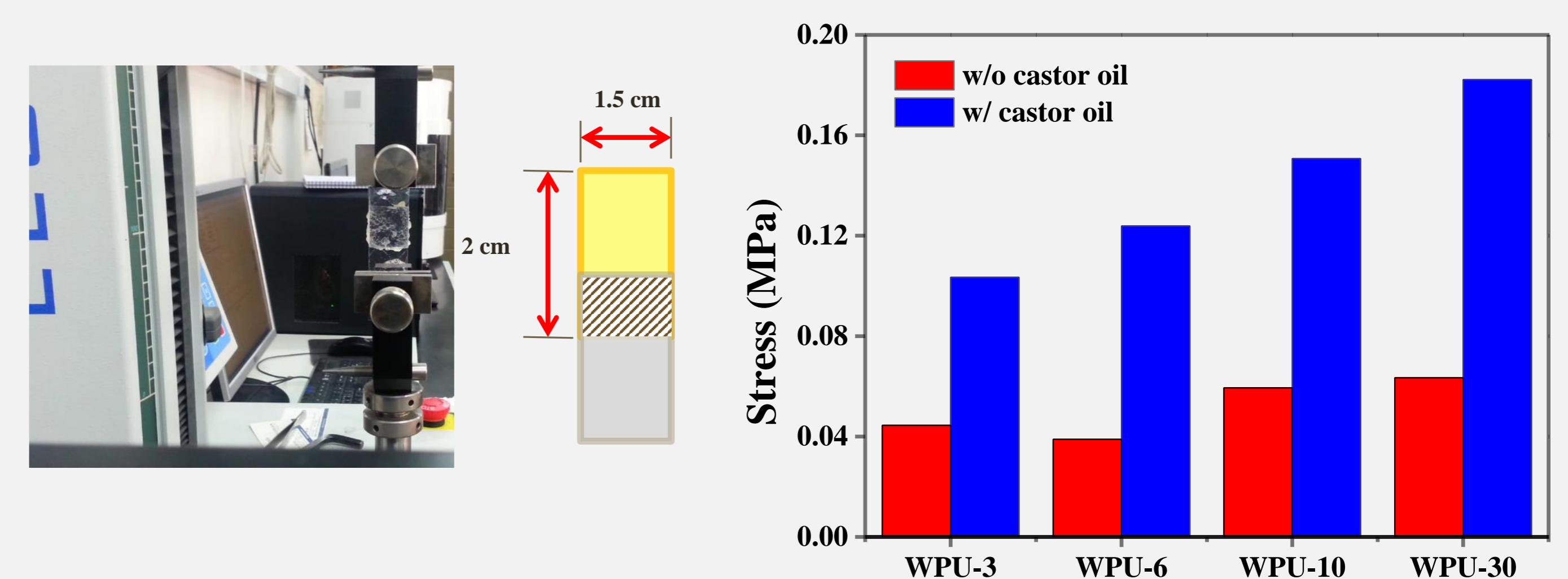


### Scheme 2

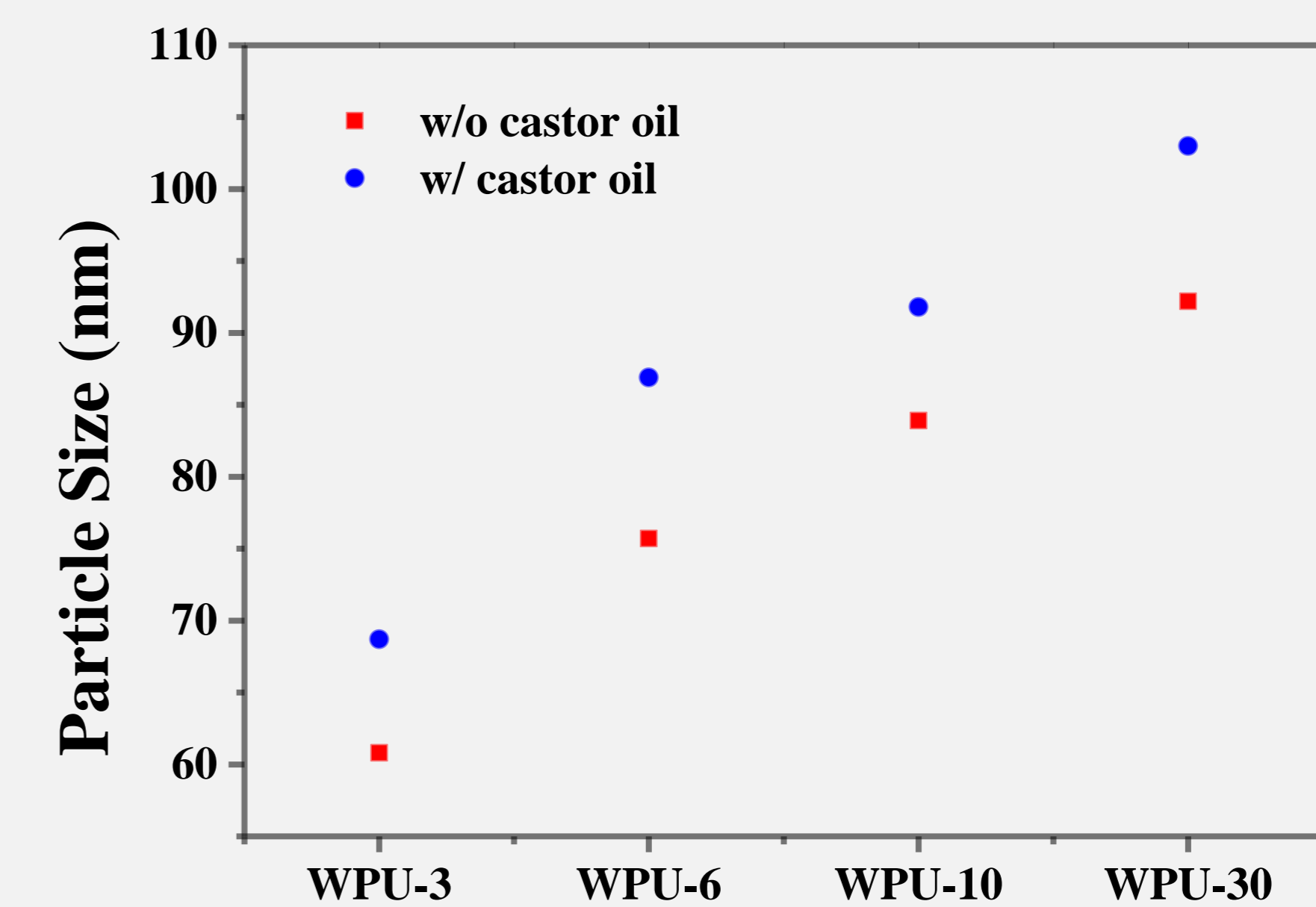


## Results

### Adhesion Tests of B-WPUs

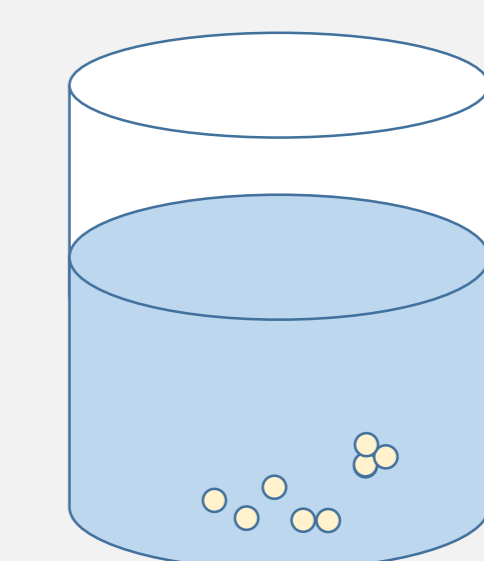


### Particle Size of B-WPUs

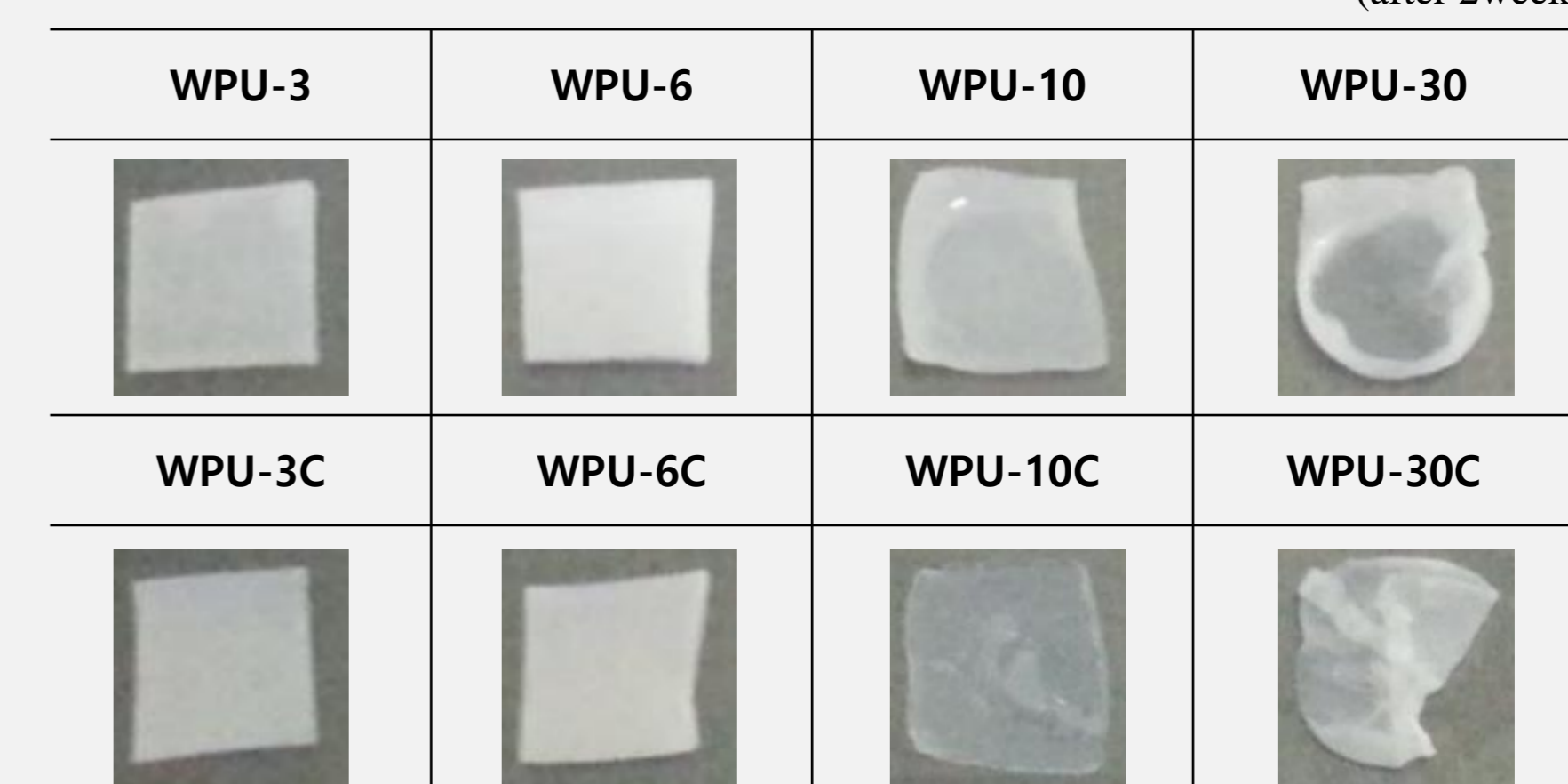


### Enzymatic Degradation Test

Film  
(1cm x 1cm x 0.2 cm)  
PH 7.2 buffer solution  
Enzyme powder 5mg/ml



(after 2week)



## 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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