

## Supporting Information

### Functionally Graded Bilayer Polyurethane Sponge with Sequential Stage-Adaptive Capabilities for Full-Cycle Repair of Infected Wounds

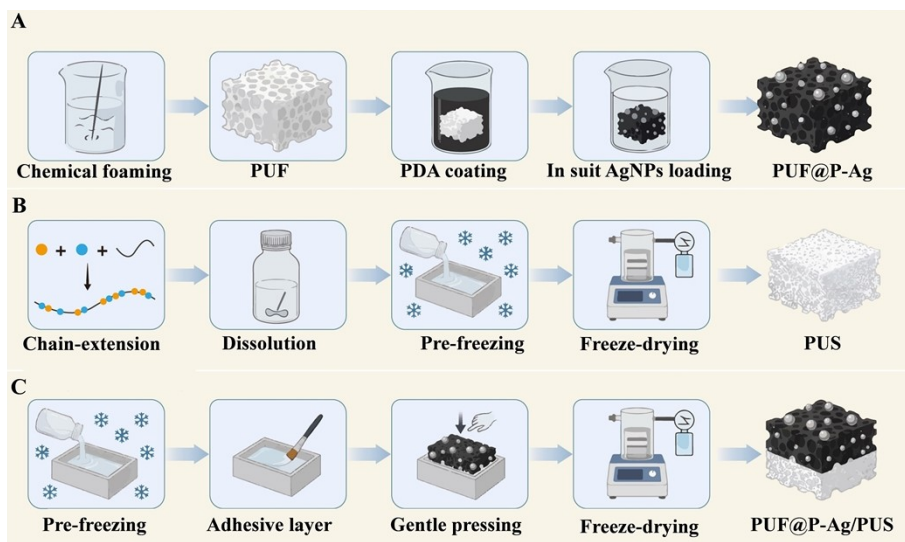
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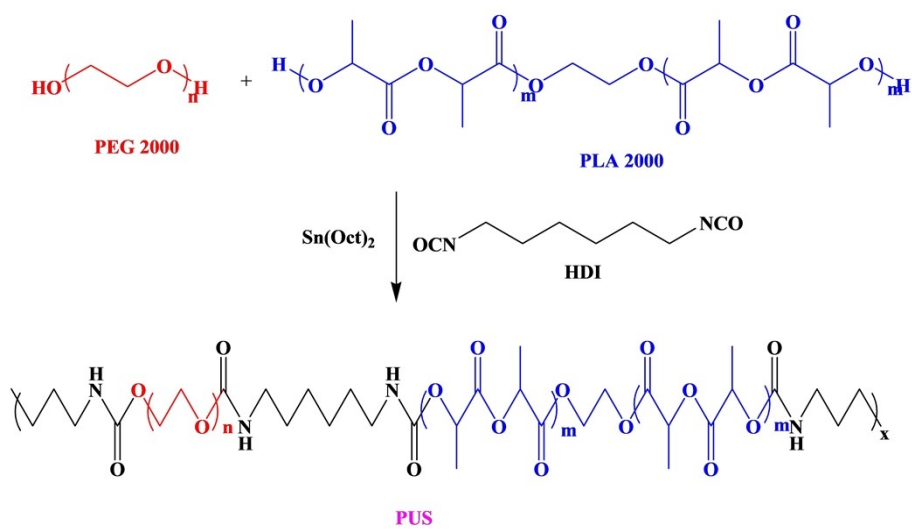
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**Table S1.** Synthetic formulae of PUS and PUF.

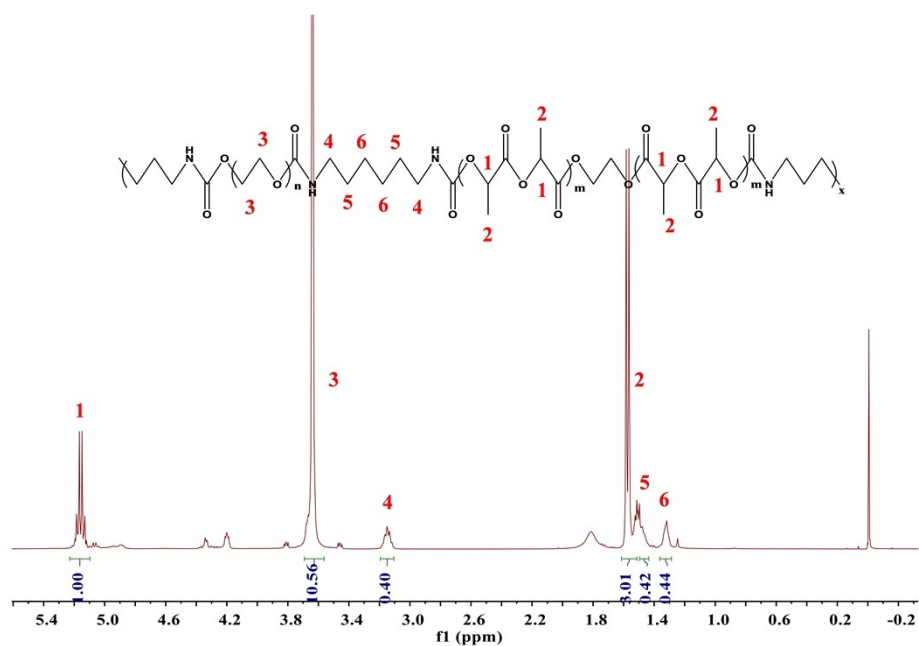
	PEG2k (g)	PLA2k (g)	Glycerol (g)	H <sub>2</sub> O (g)	Tween80 (g)	HDI (g)
PUS	12	8	0	0	0	1.85
PUF	12	8	1.35	0.33	0.25	9.3



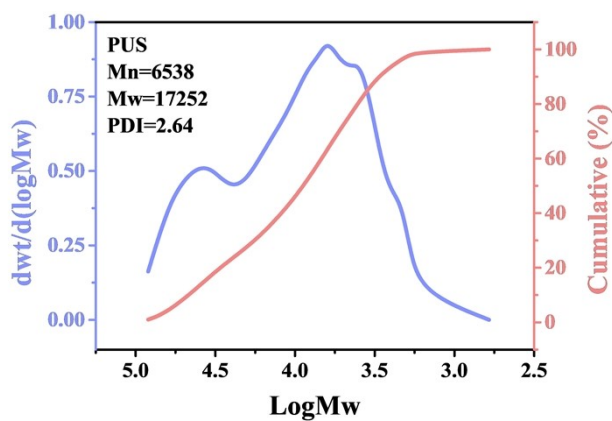
**Figure S1.** Illustration of sponges fabrication.



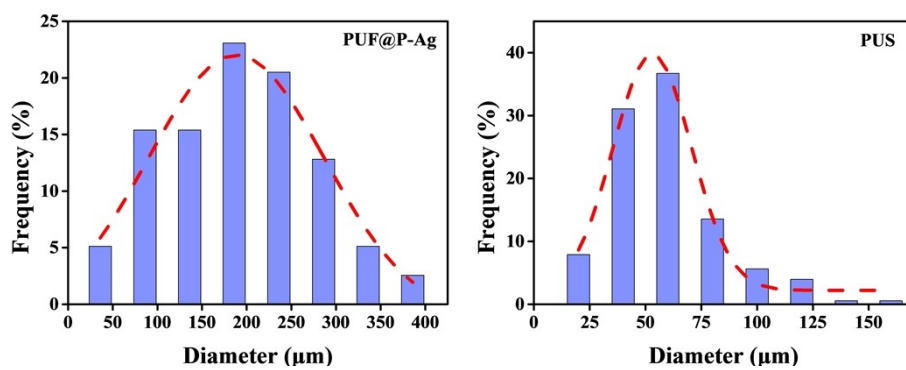
**Figure S2.** Synthetic route of PUS.



**Figure S3.** <sup>1</sup>H NMR spectrum of PUS.



**Figure S4.** Gel permeation chromatography (GPC) of PUS.



**Figure S5.** Pore size distribution of PUF@P-Ag and PUS.

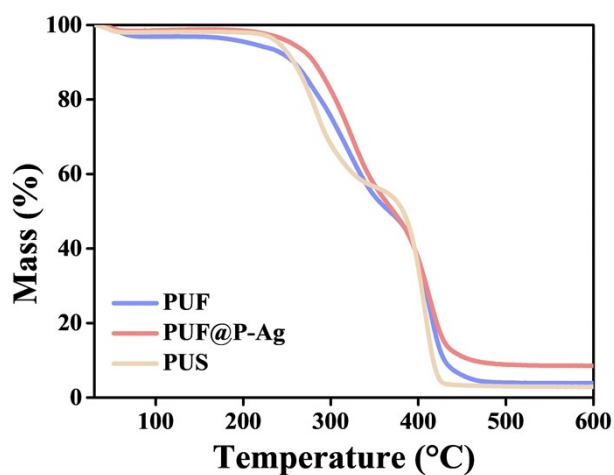


Figure S6. TGA curves of PUF, PUF@P-Ag, and PUS.

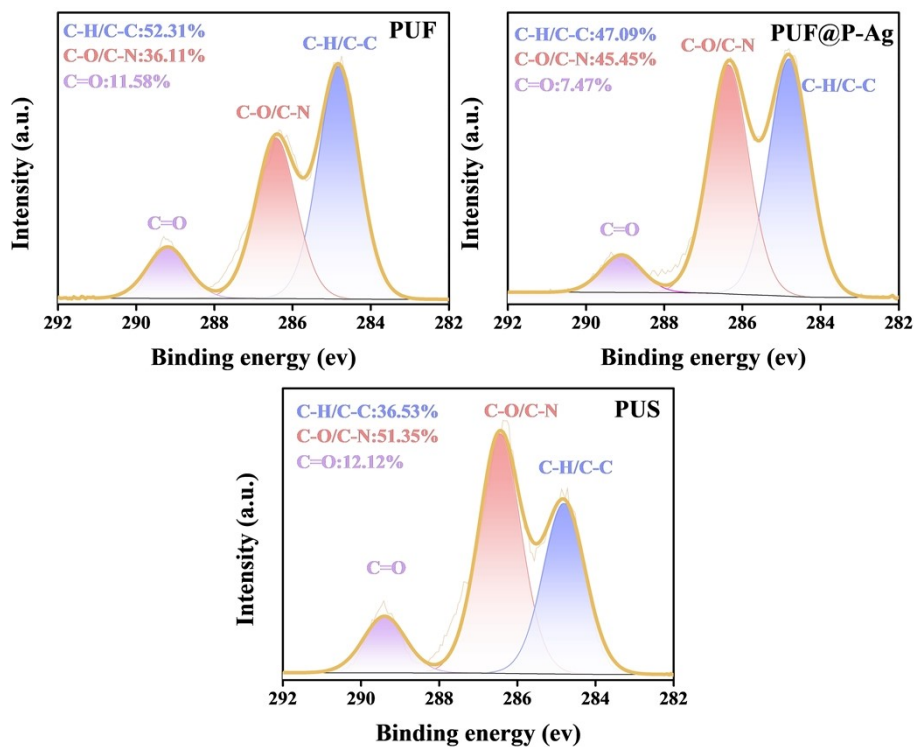
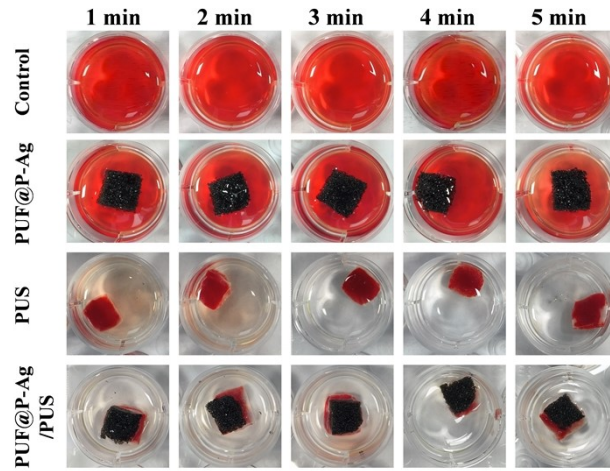
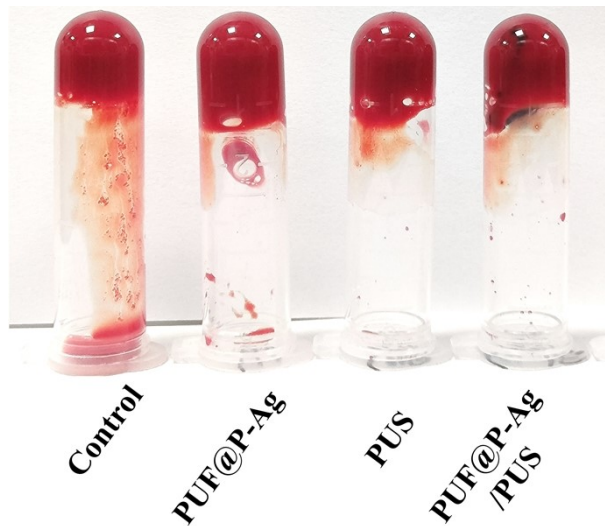


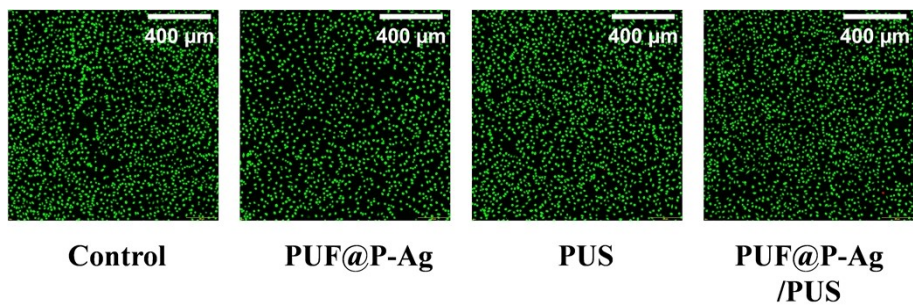
Figure S7. C1s high-resolution spectra of PUF, PUF@P-Ag, and PUS in XPS analysis.



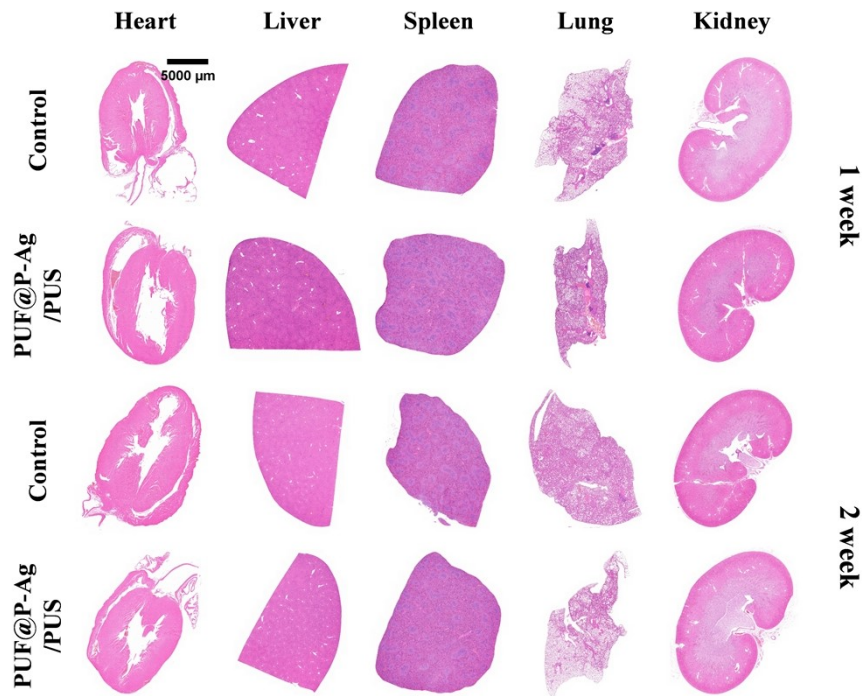
**Figure S8.** Images of PUF@P-Ag, PUS, and PUF@P-Ag/PUS sponges in BCI tests.



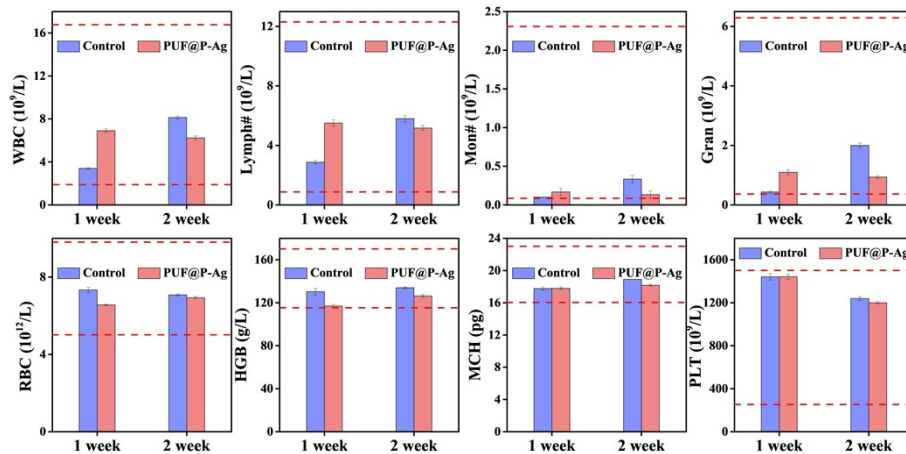
**Figure S9.** Images of PUF@P-Ag, PUS, and PUF@P-Ag/PUS sponges in BCT tests.



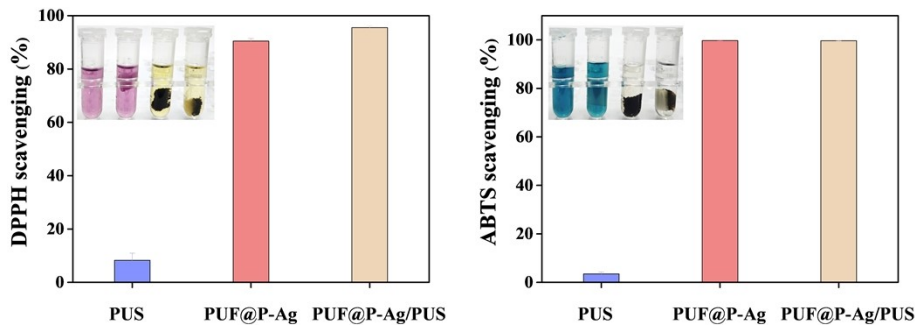
**Figure S10.** Live/dead cell staining following treatment with PUF@P-Ag, PUS, and PUF@P-Ag/PUS sponges.



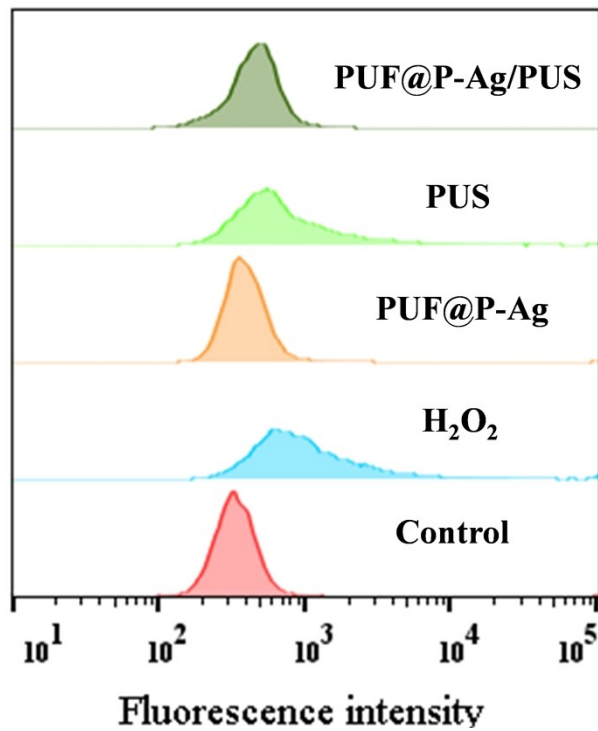
**Figure S11.** Histopathological analysis of organs at 1 and 2 weeks post-implantation.



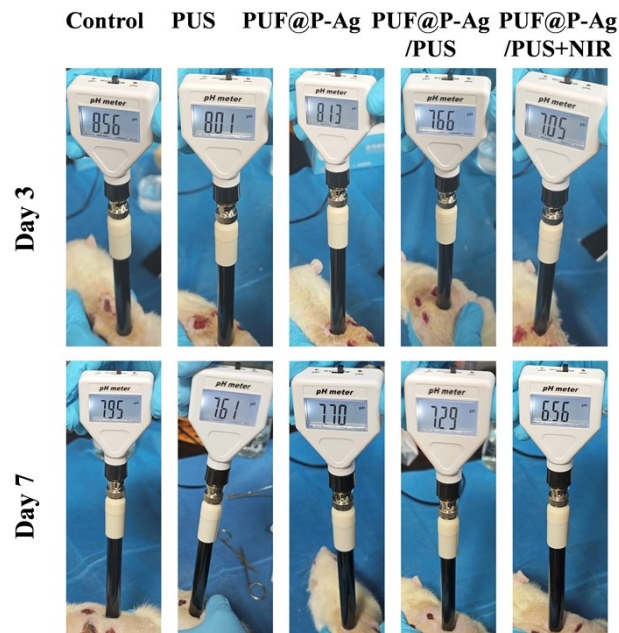
**Figure S12.** Analysis of complete blood count at 1 and 2 weeks post-implantation.



**Figure S13.** Free radical scavenging by PUS, PUF@P-Ag, and PUF@P-Ag/PUS sponges against DPPH and ABTS.



**Figure S14.** Flow cytometric analysis of intracellular ROS levels in L929 fibroblasts under different treatment conditions.



**Figure S15.** Representative photographs of wound surface pH on day 3 and day 7 for different groups.