ACCSCIENCE PUBLISHING

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RESEARCH ARTICLE

Dual-strategy modification for three-dimensional-printed silk metharcyloyl chydrogels: Nanofiber reinforcement and poly(ethylene oxide)-induced porosity

Supplementary file

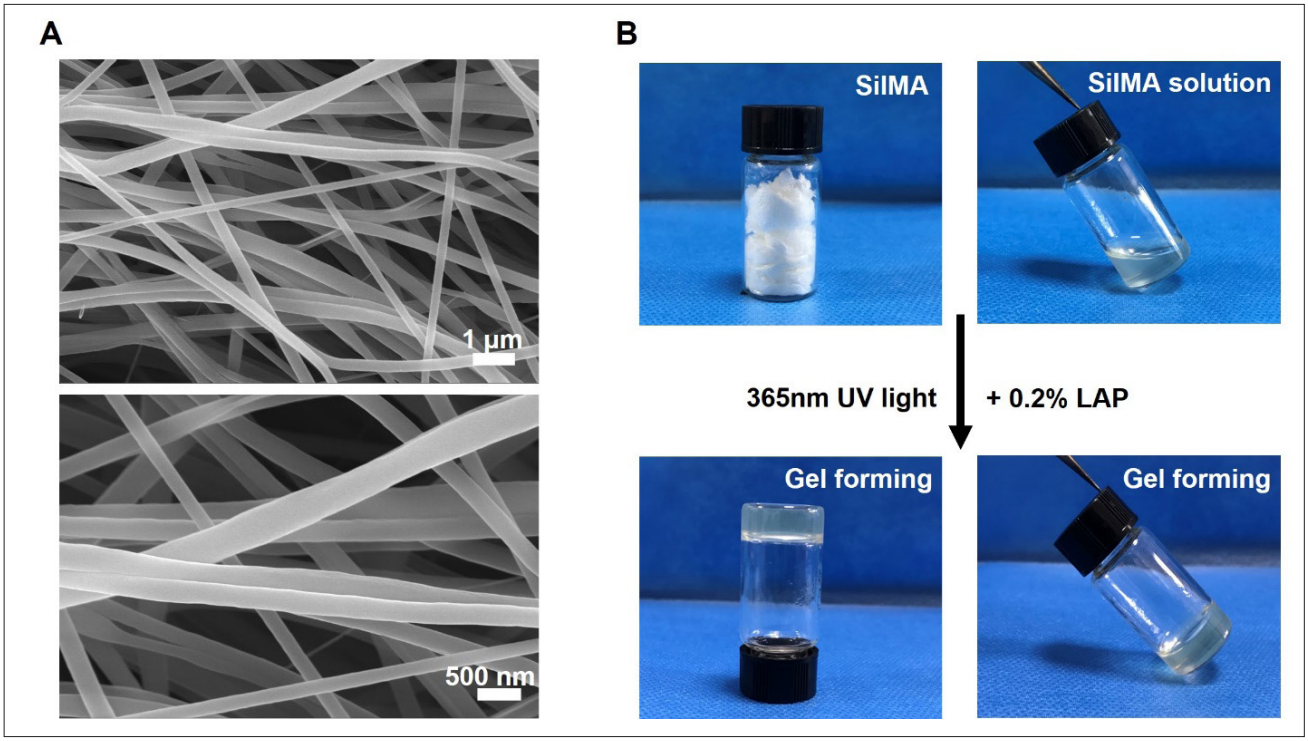

Figure S1. Characterization of SF and gelation of SilMA (A) Scanning electron microscopy images of silk fibroin electrospun nanofibers (low and high magnification). Scale bars: 1 and 500 μm; magnification: 20,000× and 10,000×. (B) Preparation and gel process of SilMA hydrogel. Abbreviations: LAP, lithium phenyl (2,4,6-trimethylbenzoyl) phosphate; SF, silk fibroin; SilMA, silk methacryloyl; UV, ultraviolet.

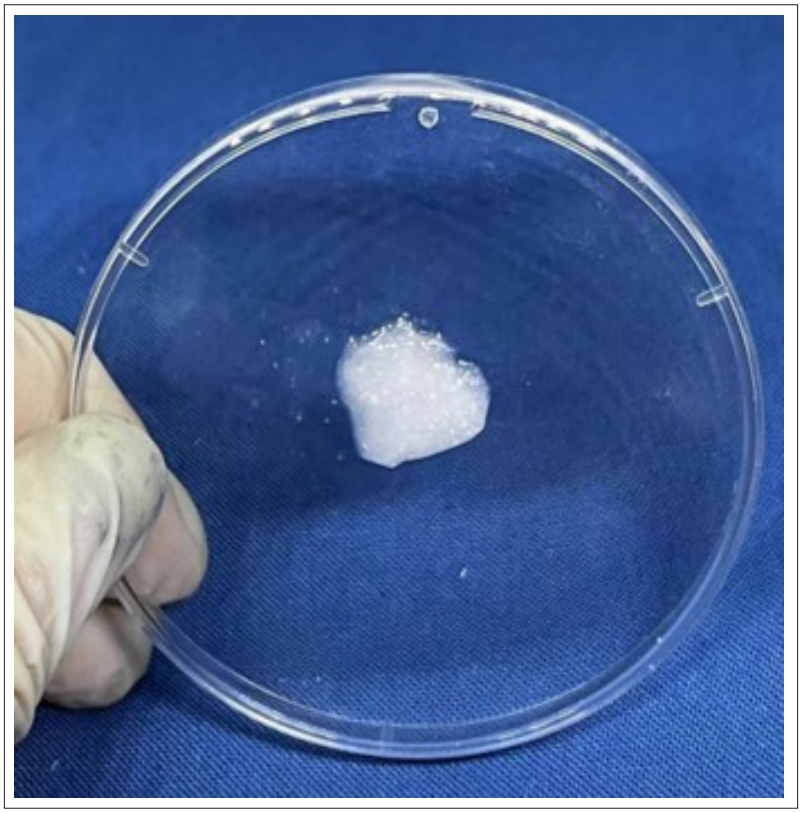

Figure S2. Photograph of three-dimensional-printed PEO/NF/SilMA hydrogel at a ratio of 1 $V_{30\%SilMA+2\%NF}$:1 V_{PEO}. Abbreviations: NF, nanofibers; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

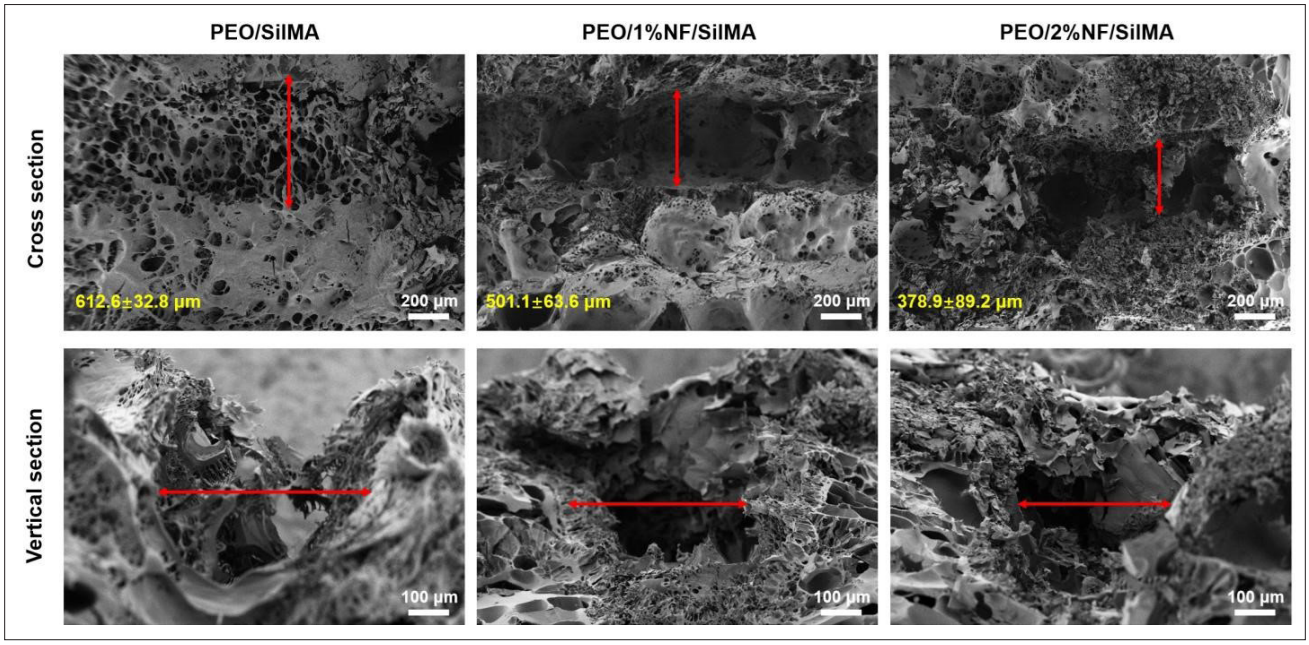

Figure S3. Representative SEM images of the cross-section and vertical section of the three-dimensional-printed scaffolds in Groups PEO/SilMA, PEO/1%NF/SilMA and PEO/2%NF/SilMA, showing the distance between the two strands after printing (the macropores in the scaffolds). Scale bar: 100, 200 μm; magnification: 100×, 28×. Abbreviations: NF, nanofiber; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

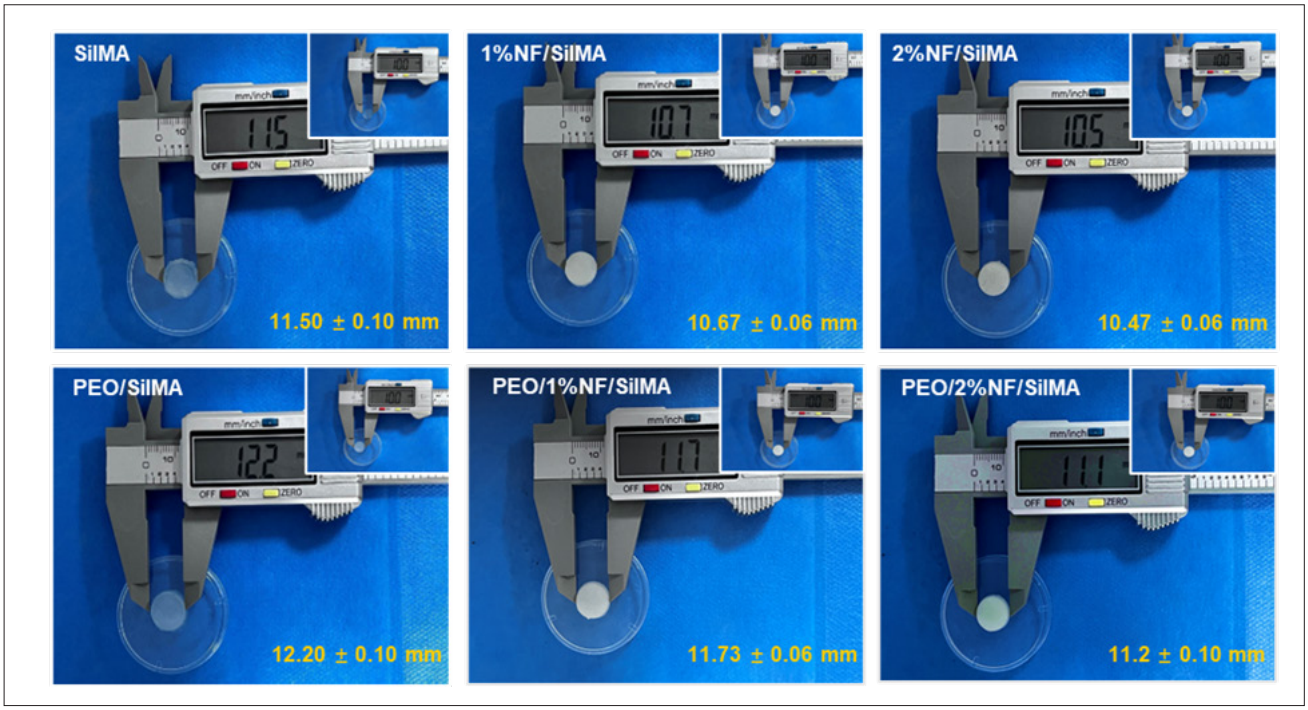

Figure S4. Photographs of six groups of hydrogel scaffolds before and after swelling. The yellow fonts represent the average values and standard deviations of the dimensions of the samples in the corresponding groups after swelling, respectively. Abbreviations: NF, nanofibers; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

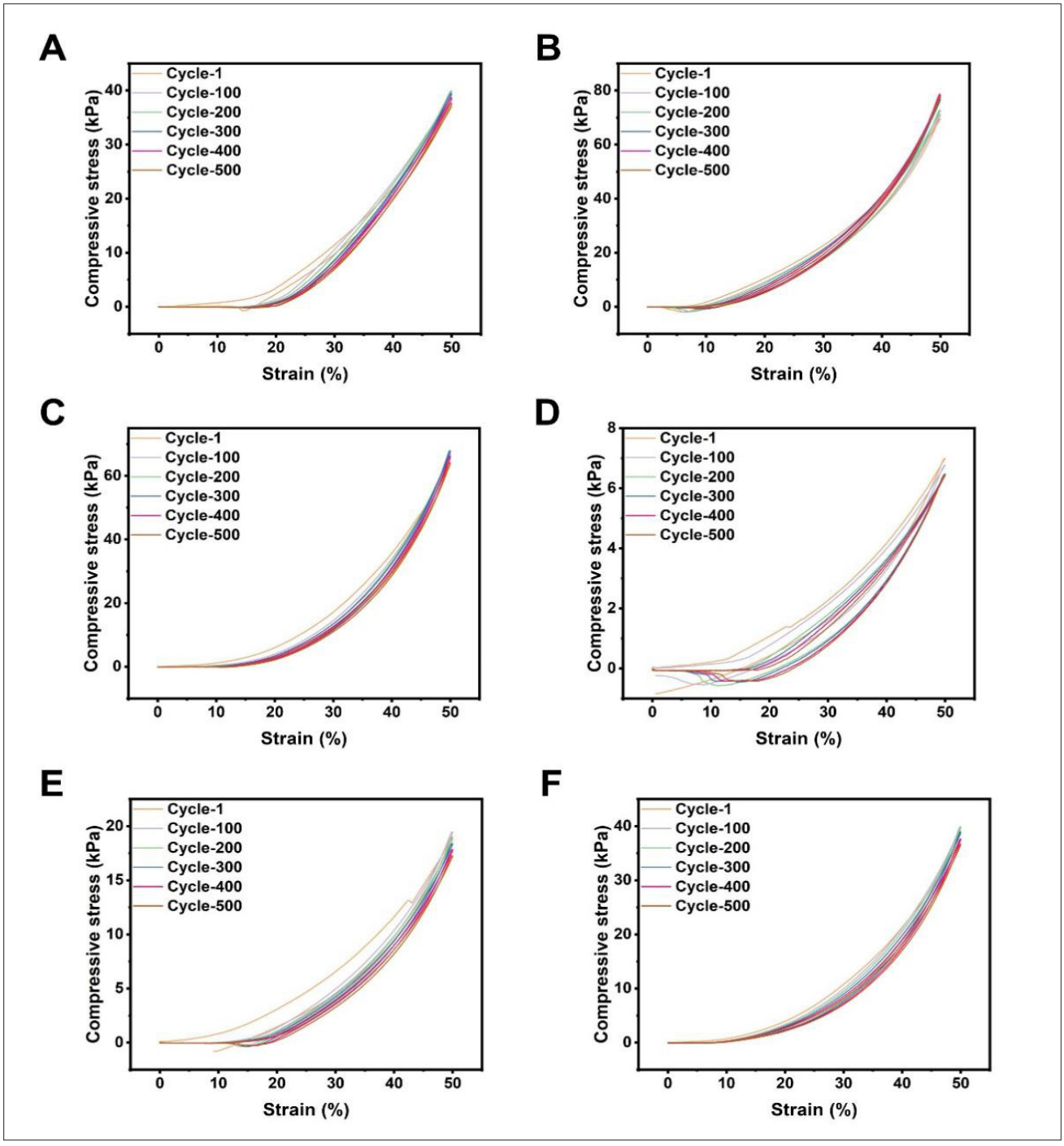

Figure S5. Stress–strain curves of the prepared hydrogel samples with cyclic compressive loading-unloading testing for 500 cycles. (A) SilMA, (B) 1%NF/SilMA, (C) 2%NF/SilMA, (D) PEO/SilMA, (E) PEO/1%NF/SilMA, (F) PEO/2%NF/SilMA. Abbreviations: NF, nanofibers; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

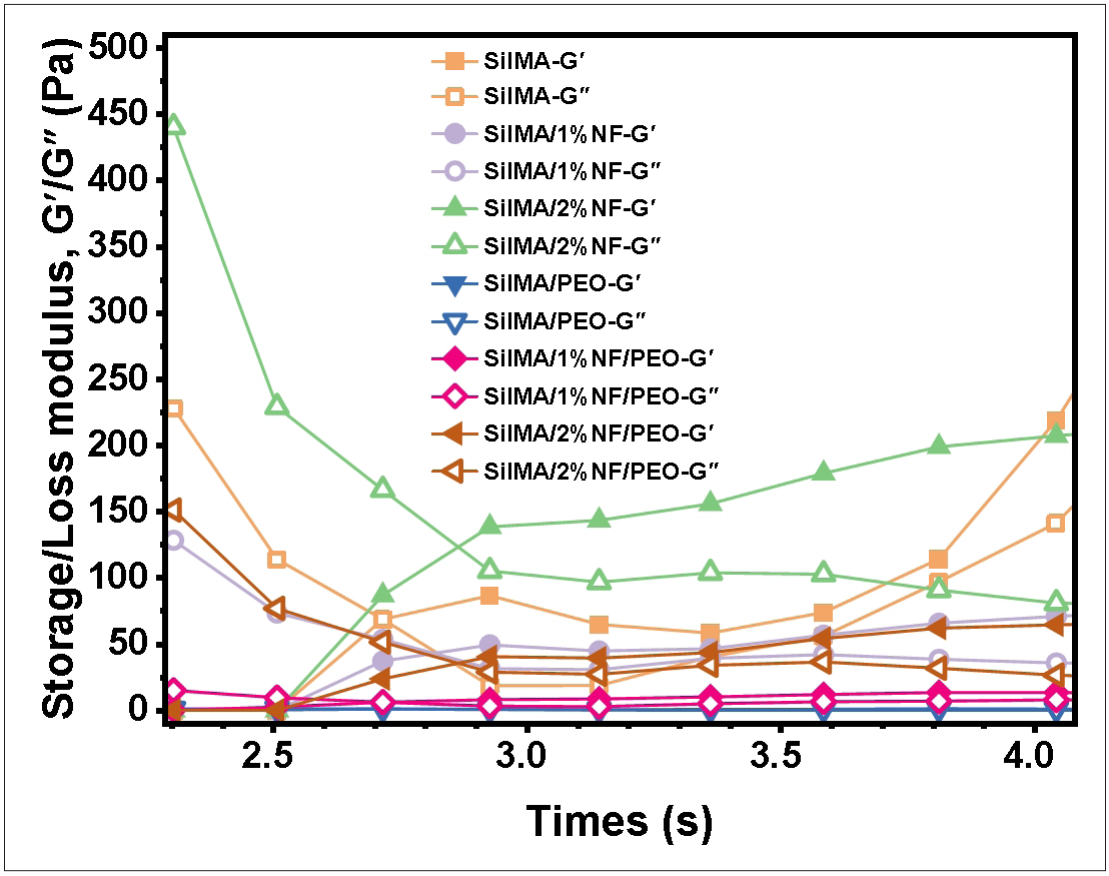

Figure S6. Ultraviolet time–oscillation scan of the hydrogel with magnification in the 0–4 s time period. Abbreviations: NF, nanofibers; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

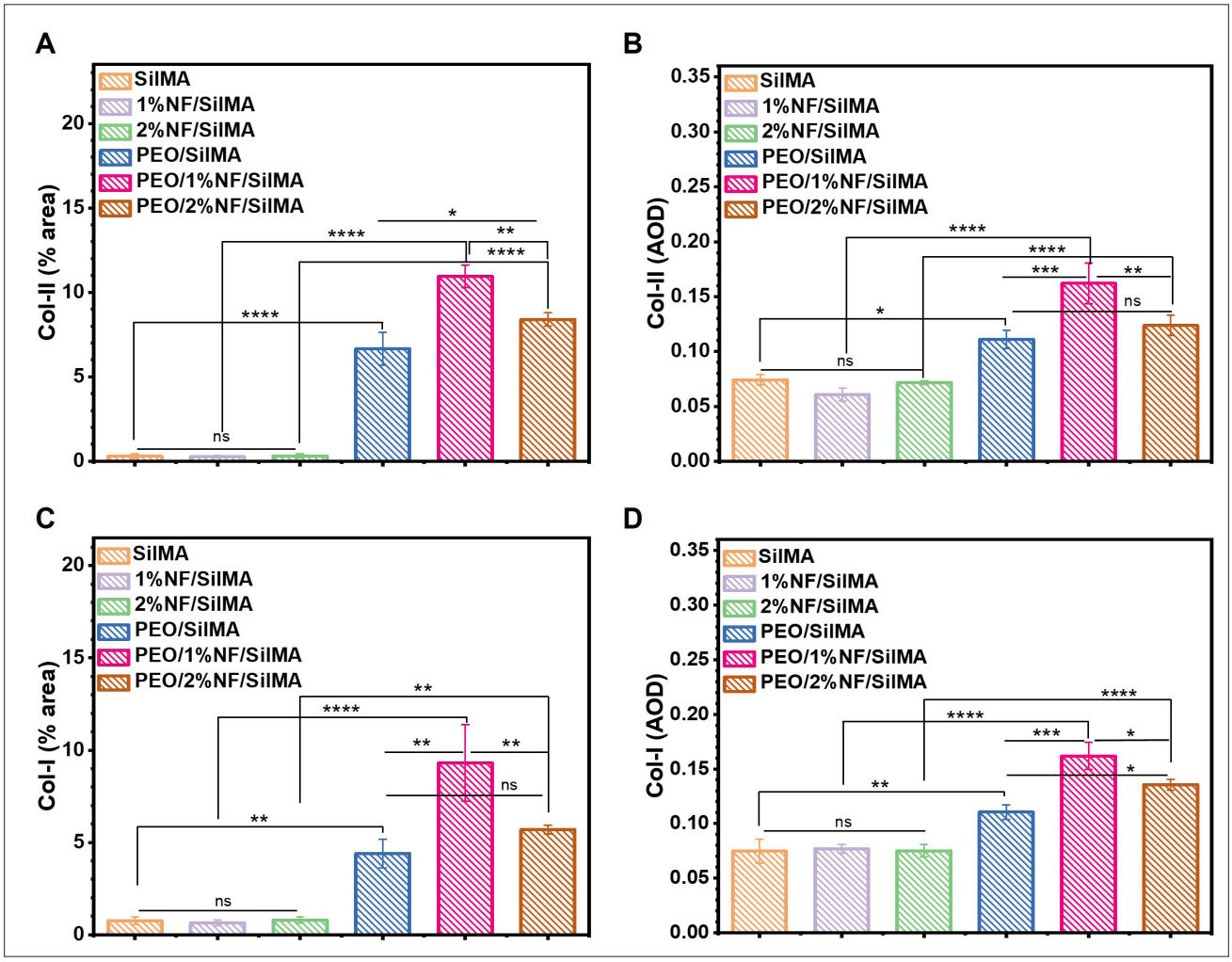

Figure S7. Quantitative analysis of immunohistochemical staining. (A and B) Positive area ratio and average optical density of Col-II. (C and D) Positive area ratio and average optical density of Col-I. Abbreviations: AOD, average optical density; NF, nanofibers; PEO, poly(ethylene oxide); SilMA, silk methacryloyl.

Table S1. Primer sequences for real-time quantitative polymerase chain reaction

Gene	Forward primer	Reverse primer
MKI67	AGAACTCTCTACCGTGAC	ACCAGTCAGGTCTTCCAC
COL2A1	CTGCAGCACGGTATAGGTGA	AACACTGCCAACGTCCAGAT
ACAN	GCTACCCTGATCCCTCATCC	GATGTCCTCTTCACCACCCA
SOX9	AGCACAAGAAAGACCACCCC	GACCCTGAGATTGCCCGGAG