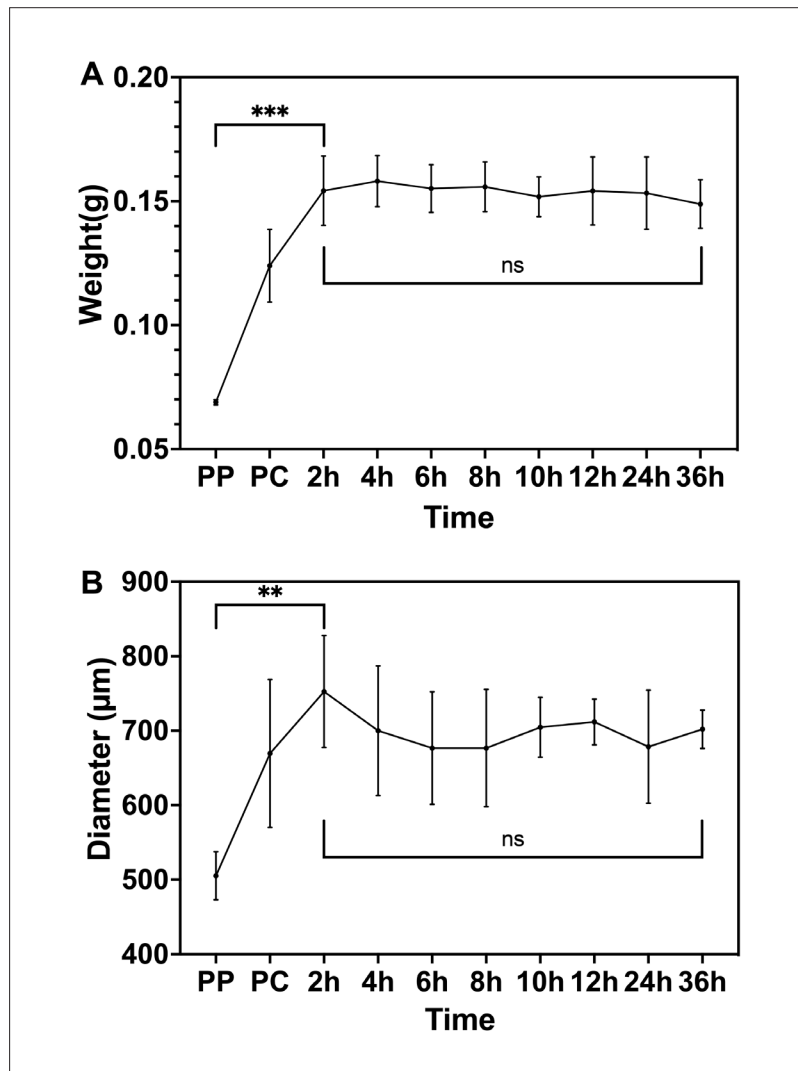


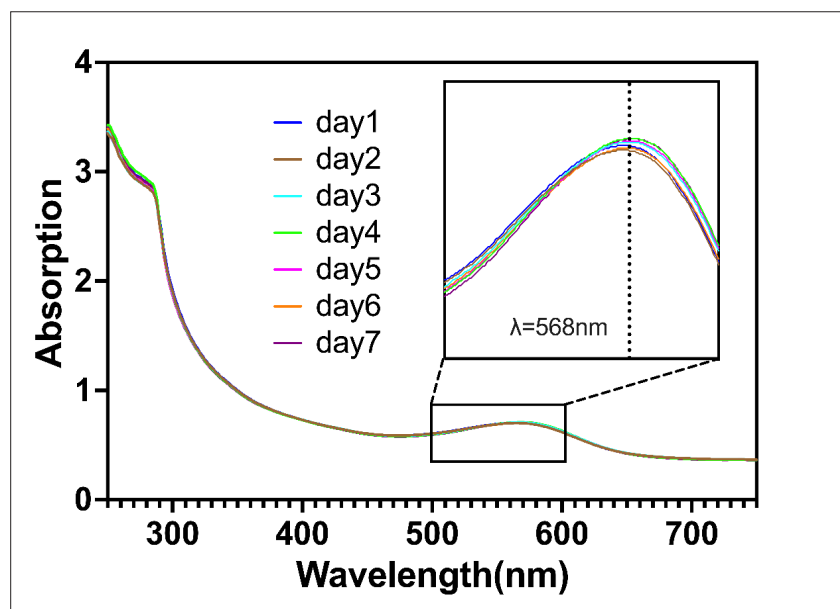
RESEARCH ARTICLE

Fabrication of bacteriorhodopsin-embedded hydrogel construct for biocompatible photosensitive device

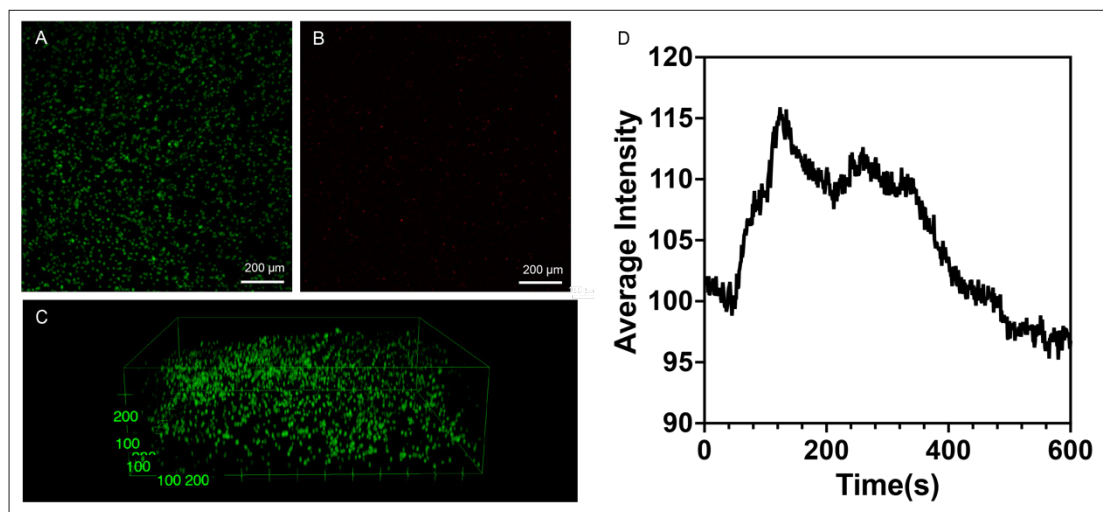
Supplementary File



**Figure S1.** Swelling of bacteriorhodopsin (br)-embedded hydrogel. The *t*-tests were performed between the post-print and 2-h time points, while analysis of variance (ANOVA) was conducted for the groups from 2 to 36 h. Data is presented as the mean  $\pm$  standard deviation. (A) Change in the weight of the hydrogel structure (*t*-test:  $p = 0.0005$ ; ANOVA:  $p = 0.9872$ ). (B) Change in the diameter of hydrogel filaments (*t*-test:  $p = 0.0064$ ; ANOVA:  $p = 0.8594$ ). The weight and diameter were measured immediately after printing/crosslinking, i.e., at every 2 h for the first 12 h, as well as at 24 and 36 h. The weight and diameter of the hydrogel structure immersed in Dulbecco's phosphate-buffered saline (DPBS) increased during the first 2 h and remained stable through 36 h post-printing.  $**p < 0.01$ ;  $***p < 0.001$ . Abbreviations: PP: Post-print; PC: Post-crosslink; ns: Not significant.



**Figure S2.** Bacteriorhodopsin (br) retention in the fabricated hydrogel construct through absorption spectrum analysis. The hydrogel construct was immersed in Dulbecco's phosphate-buffered saline (DPBS) for seven days, and the absorption spectrum was recorded daily. The 568 nm absorption peak, corresponding to the retinal in br, remained detectable seven days after fabrication.



**Figure S3.** Biocompatibility assessment results. (A and B) Live (green; A)/dead (red; B) images of neural progenitor cells (NPCs) within the bacteriorhodopsin (br)-embedded hydrogel; scale bars: 200  $\mu\text{m}$ . (C) 3D volume view of NPCs in the br-embedded hydrogel (merged green and red channels); scale bar: 100  $\mu\text{m}$ . The live-dead assay was performed on day 1 of culture, displaying a cell viability of 91.09% (standard deviation: 2.64%). (D) Average intensity of the calcium assay recorded on day 6 of culture. Changes in average density indicate neural activity of NPCs within the br-embedded hydrogel.