

## Supporting information

# Bioactive cell niche mediating uniform thermal stimulus for BMSCs neural differentiation through TRPV1 channel activation

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Table S1. Composition of various hydrogels

Samples	Collagen concentration (mg/mL)	Modified HA		
		Concentration (mg/mL)	DS of MA (%)	DS of DA (%)
CHM	4	1	41	0
CHD-L	4	1	0	11
CHD-M	4	1	0	17
CHD-H	4	1	0	24

Table S2 Primers of neuro-related genes

Gene	Primers	
MAP-2	F: GCAAAGTAAGCCTGGTGA	R: ATCTAAGGGAAGAGTGAAAC
NF-L	F: TGGAGAATGAGCTGAGAAGC	R: TTCGTAGCCTCAATGGTCTC
Nestin	F: GGGCAAGTGGAAACGTAGA	R: TCCCACCGCTGTTGATTT
NSE	F: TGGATGTGGCTGCCTCTG	R: TCCTGGTCGAATGGGTCT
Tuj1	F: GCCTGACAAC TTTATCTTCGG	R: CATTGAGCTGACCAGGGAAT
TRPV1	F: CACAGAGTGGACCCAGATACG	R: CACTCGAGATAGACATGCCACC
GFAP	F: ACATCGAGATCGCCACCTAC	R: ACATCACATCCTTGTGCTCC
GAPDH	F: GCCAAAAGGGTCATCATCTCTG	R: CATGCCAGTGAGCTTCCCCT

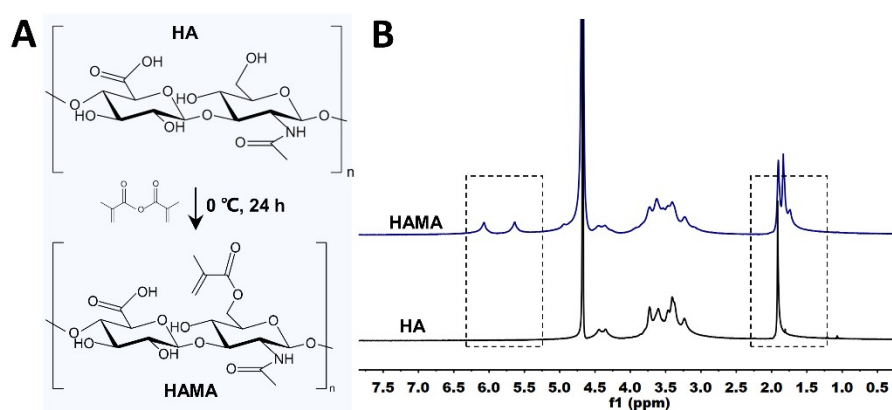


Figure S1. (A) Synthesis route and chemical structure of MA-modified HA (HAMA). (B) <sup>1</sup>H NMR spectra of HA and HAMA. <sup>1</sup>H NMR spectrum of HAMA exhibited peaks of vinyl methylene ( $\delta$  6.1 and  $\delta$  5.6) and methyl protons ( $\delta$  1.8), respectively. The DS of methacrylation group of HAMA was roughly 41%.

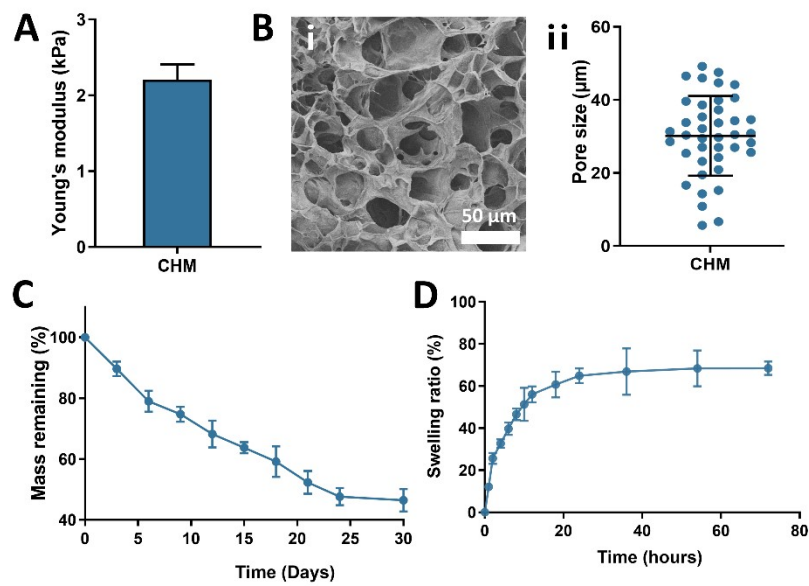


Figure S2. (A) Young's modulus of CHM hydrogel ( $2.22 \pm 0.20$  kPa). (B) SEM image (i) and pore size (ii) of CHM hydrogel. (C) Degradation behaviors of CHM hydrogel. (D) Swelling behavior of CHM hydrogel. (n=5)

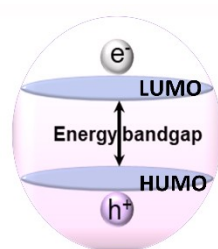


Figure S3. Schematic illustration of photothermal polymeric material.

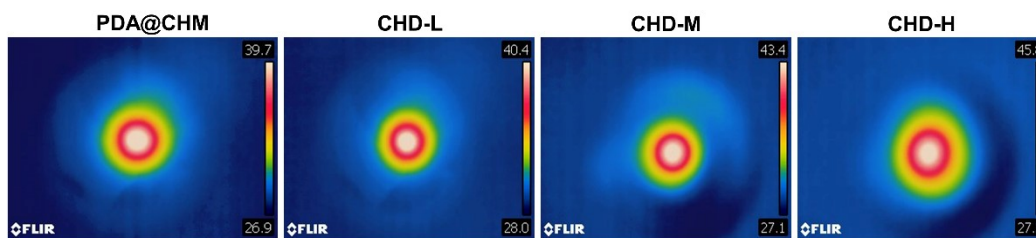


Figure S4. Thermal infrared images of PDA@CHM and CHD hydrogels (CHD-L, CHD-M, CHD-H).

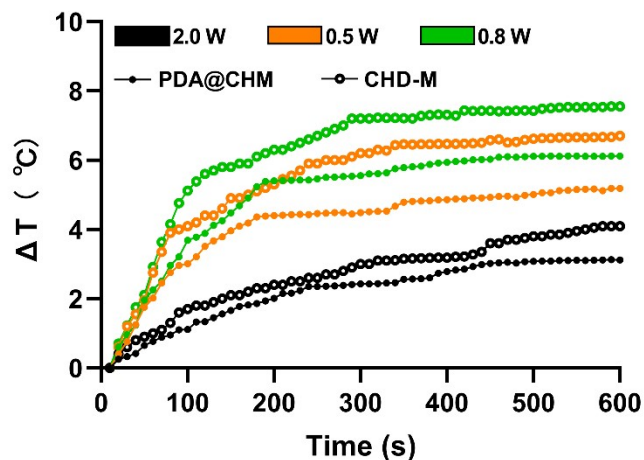


Figure S5. Temperature change curves of PDA@CHM hydrogel and CHD-M hydrogel with different NIR power.

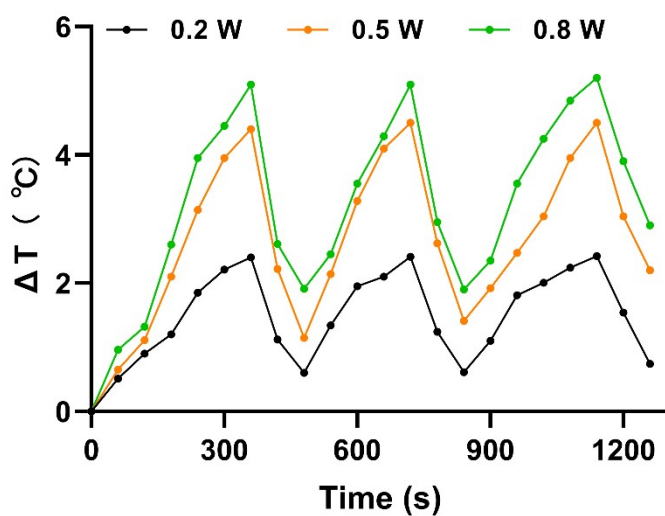


Figure S6. Temperature change curves of PDA@CHM hydrogel with different NIR power over three cycles of different laser irradiation on/off.

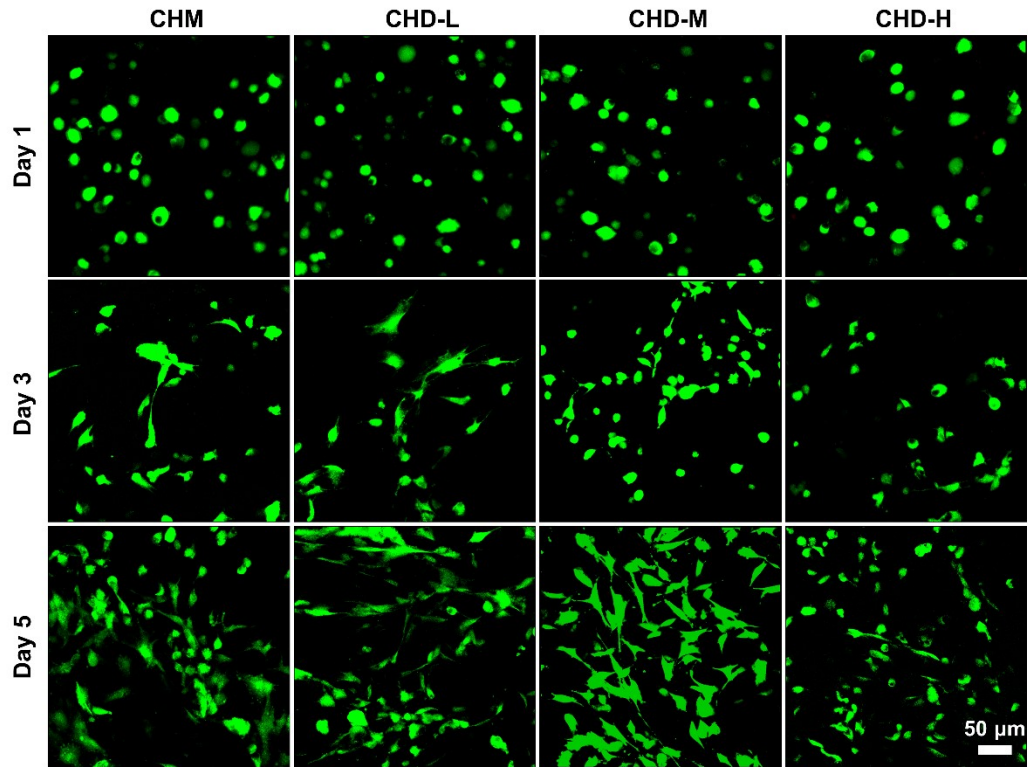


Figure S7. Representative CLSM images of FDA (green)/PI (red) co-staining of BMSCs in CHM, CHD-L, CHD-M and CHD-H hydrogel after 5 days of culture.

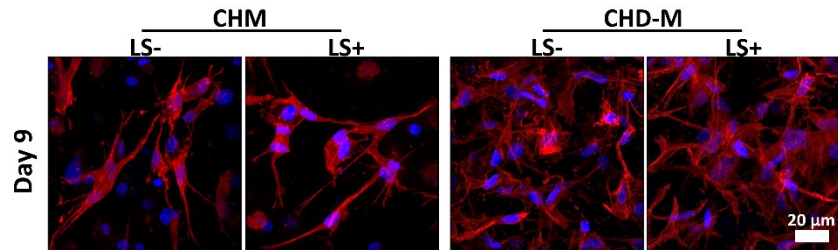


Figure S8. CLSM images of cytoskeleton (red) / nucleus (blue) co-staining of BMSCs in CHM and CHD-M hydrogel under NIR after 9 days.

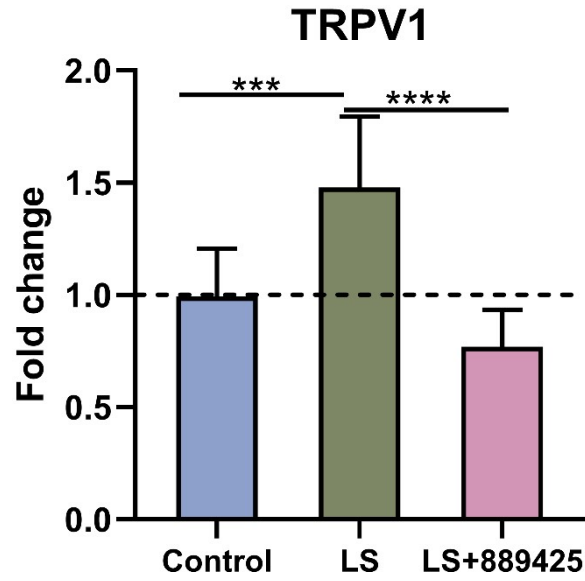


Figure S9. The gene expression of TRPV1 of BMSCs in CHD-M hydrogel with or without 889425 treatment.