



## Supporting Information

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Nanocomposite Bioinks Incorporating Cu-Doped  
Mesoporous Bioactive Glass Nanoparticles for Bone  
Tissue Engineering

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## 3D Bioprinting of Multi-functional Dynamic Nanocomposite Bioinks incorporating Cu-doped mesoporous bioactive glass nanoparticles for Bone Tissue Engineering

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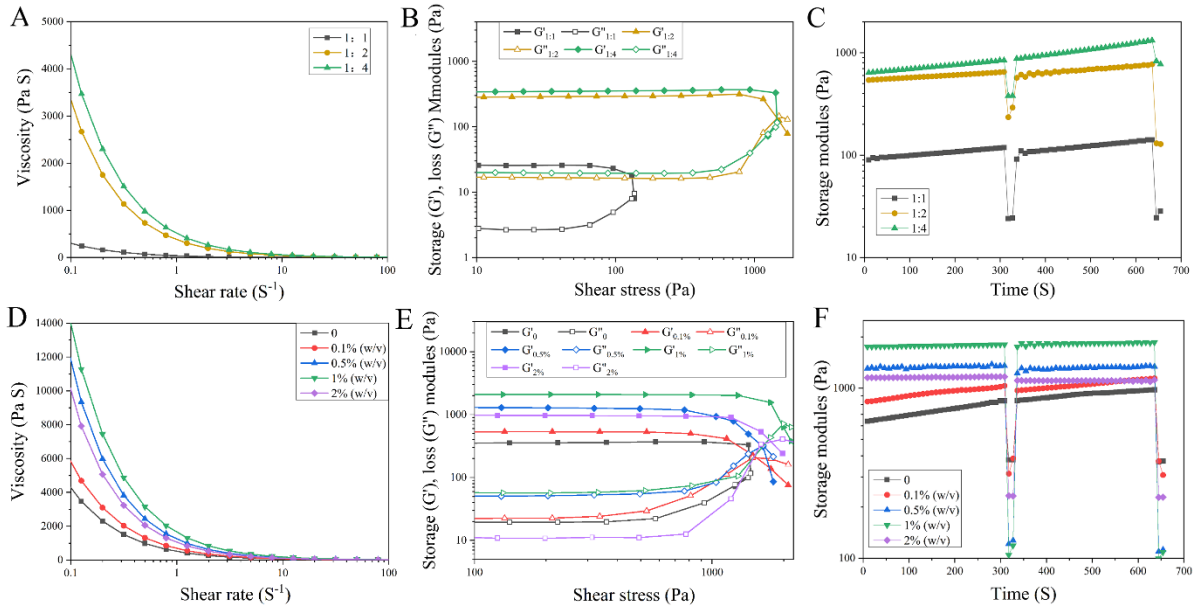


Figure S1. Rheology properties of inks with various compositions. (A) Shear thinning properties, (B) variations of storage and loss modulus with stress, and (C) shear recovery properties of AG with different ADA to AGEL ratio of 1:1, 1:2 and 1:4, respectively. (D) Shear thinning properties, (E) variations of storage and loss modulus with stress, and (F) shear recovery properties of AG with AMBGN amounts of 0, 0.1, 0.5, 1 and 2 % (w/v) respectively.

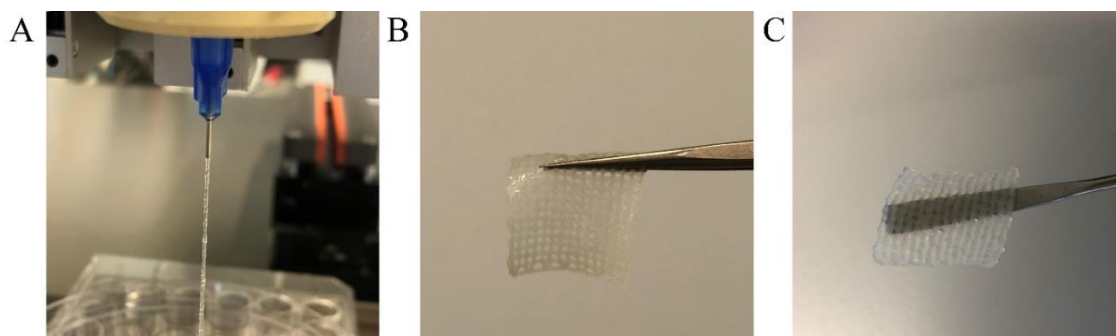


Figure S2. (A) Extruded strand of AG-ACuMBGN. Printed thin layers by using (B) AG-ACuMBGN and (C) AG inks, respectively.

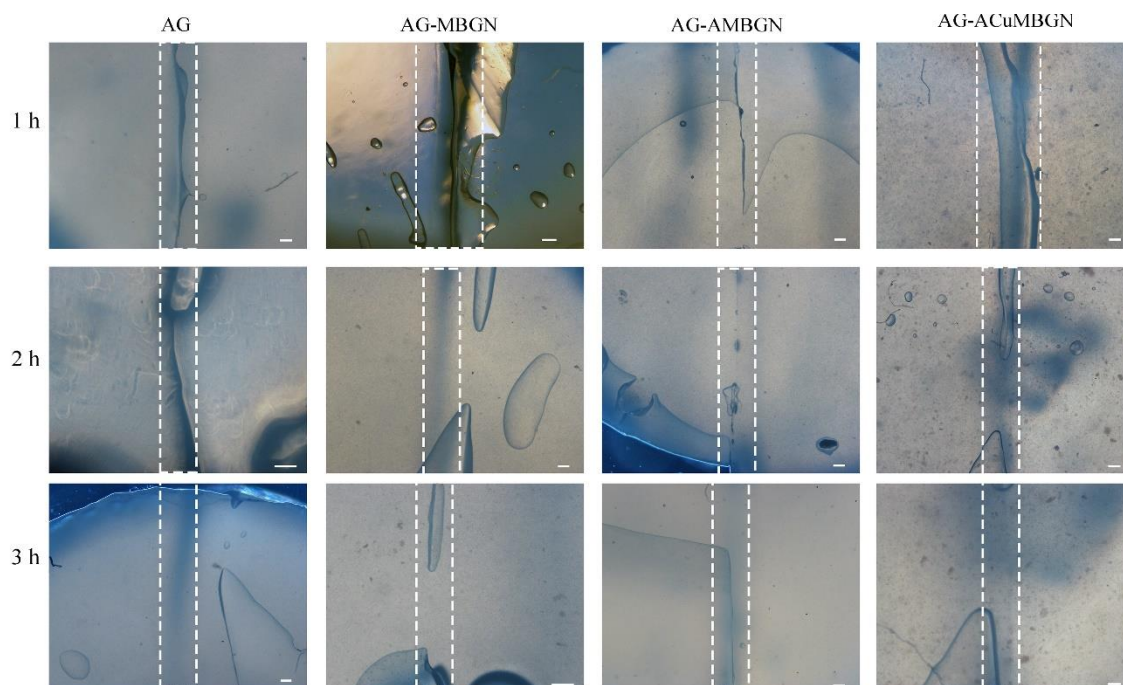


Figure S3. Optical images of the self- healing process at first 1, 2, 3 h of AG, AG-MBGN, AG-AMBGN and AG-ACuMBGN hydrogels. The dotted box indicates the healing interface. Scale bar = 200  $\mu$ m.

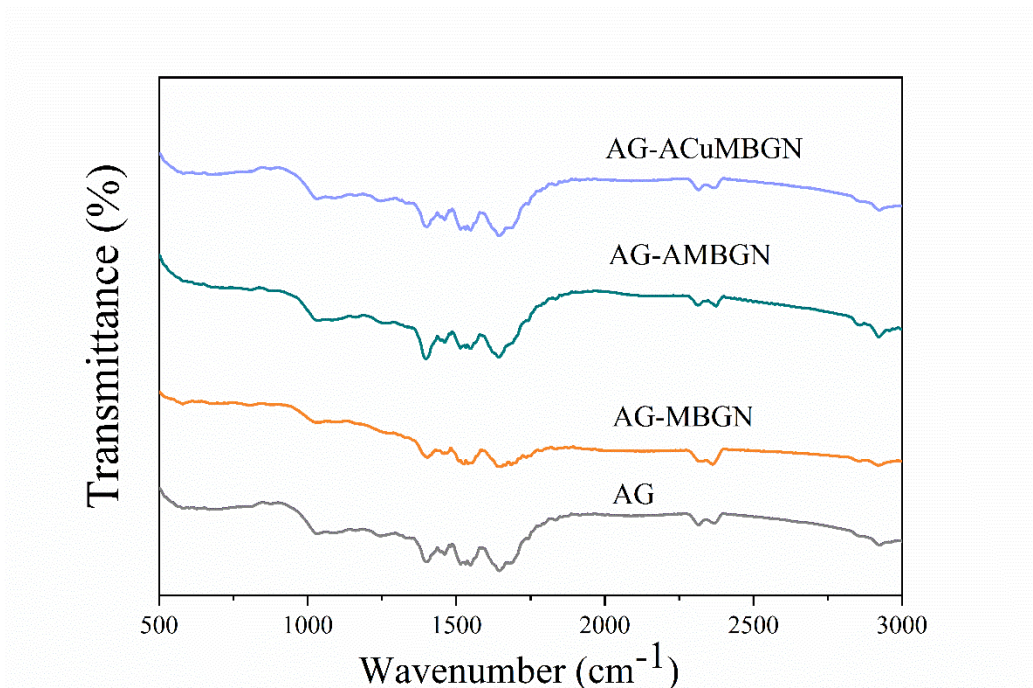


Figure S4. FTIR spectra of AG, AG-MBGN, AG-AMBGN and AG-ACuMBGN hydrogels.

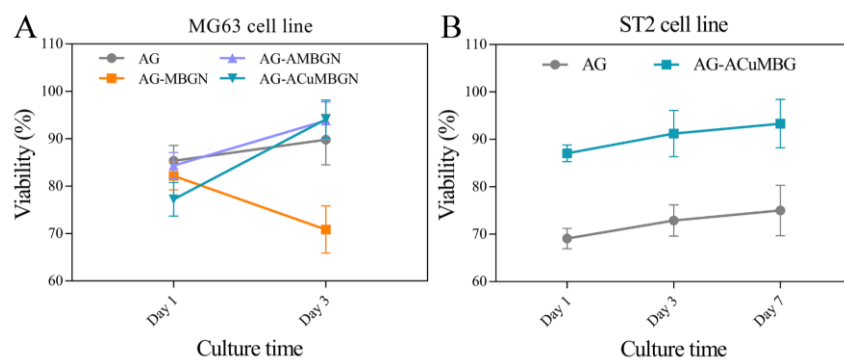


Figure S5. Quantitative evaluation of the (A)MG63 and (B) ST2 viability from the live/dead staining results in printed samples with different compositions.



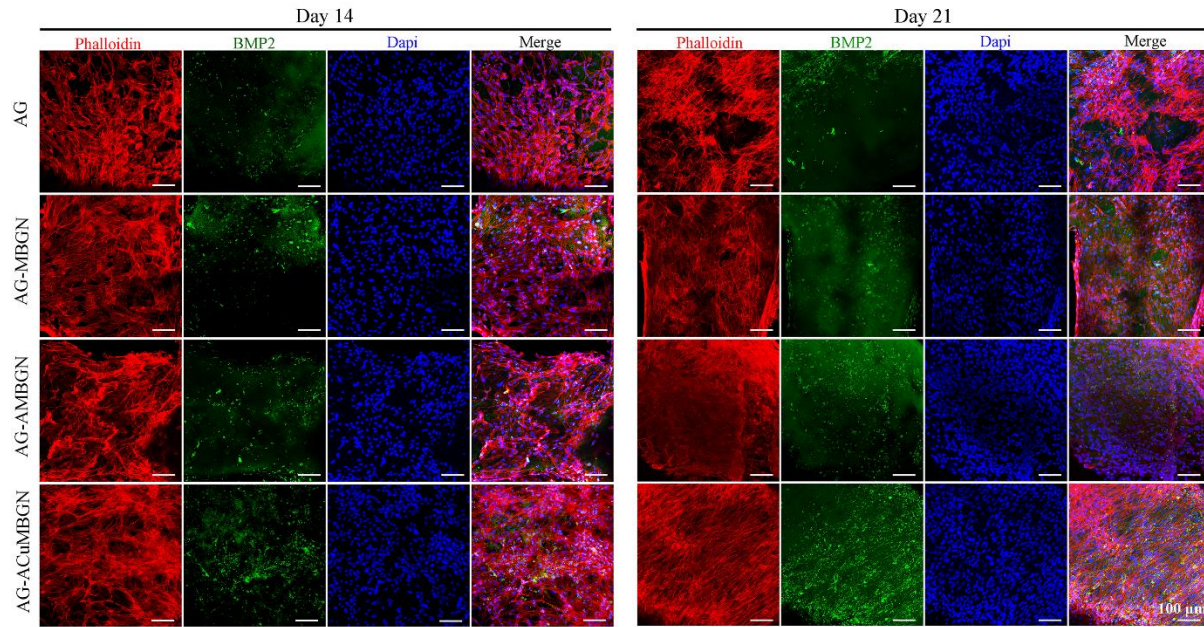


Figure S6. Immunofluorescence (scale bar: 100 μm) staining of PI (red), BMP2 (green), and nuclei staining (blue) of bioprinted BMSCs on day 14 and 21.

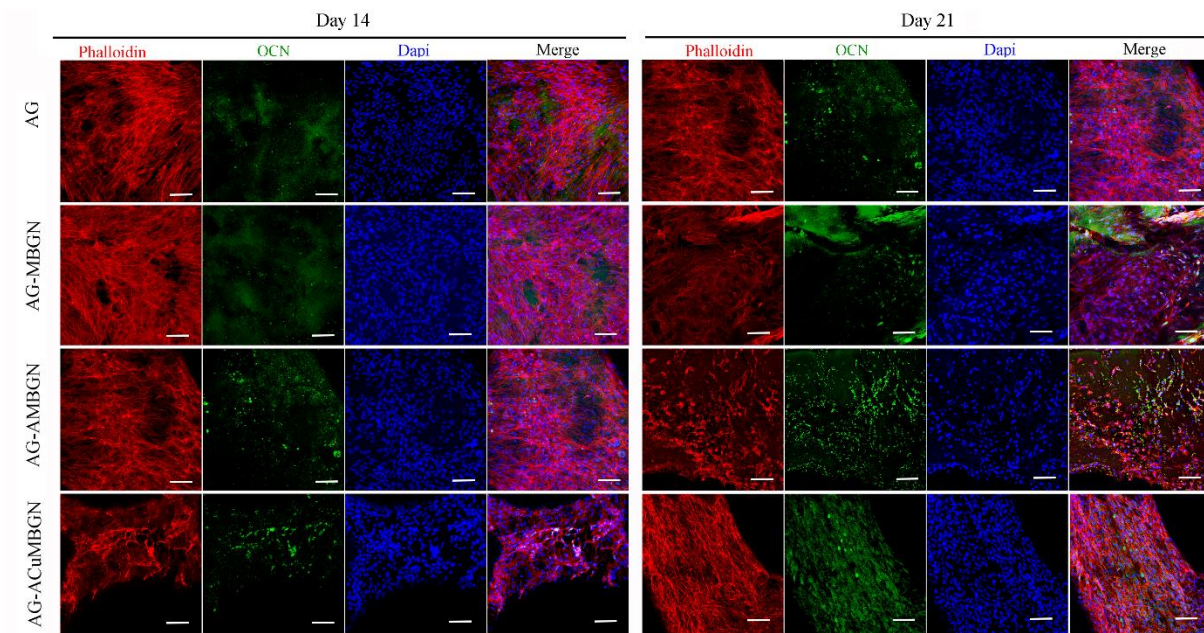


Figure S7. Immunofluorescence (scale bar: 100 μm) staining of PI (red), OCN (green), and nuclei staining (blue) of bioprinted BMSCs on day 14 and 21.



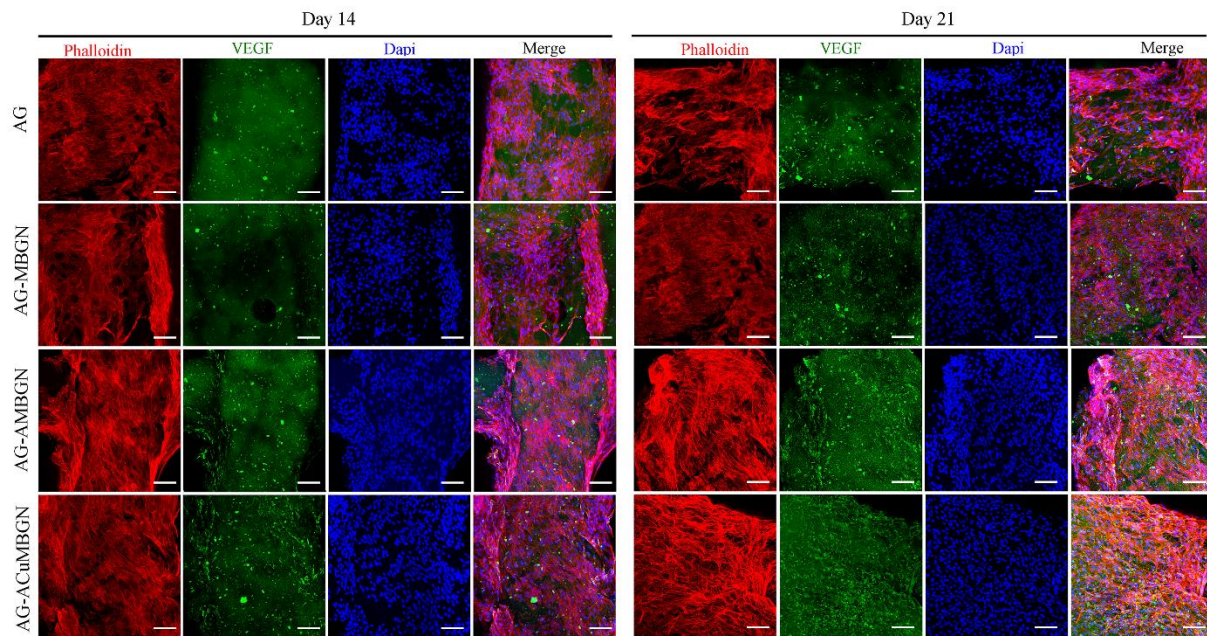


Figure S8. Immunofluorescence (scale bar: 100  $\mu$ m) staining of PI (red), VEGF (green), and nuclei staining (blue) of bioprinted BMSCs on day 14 and 21.

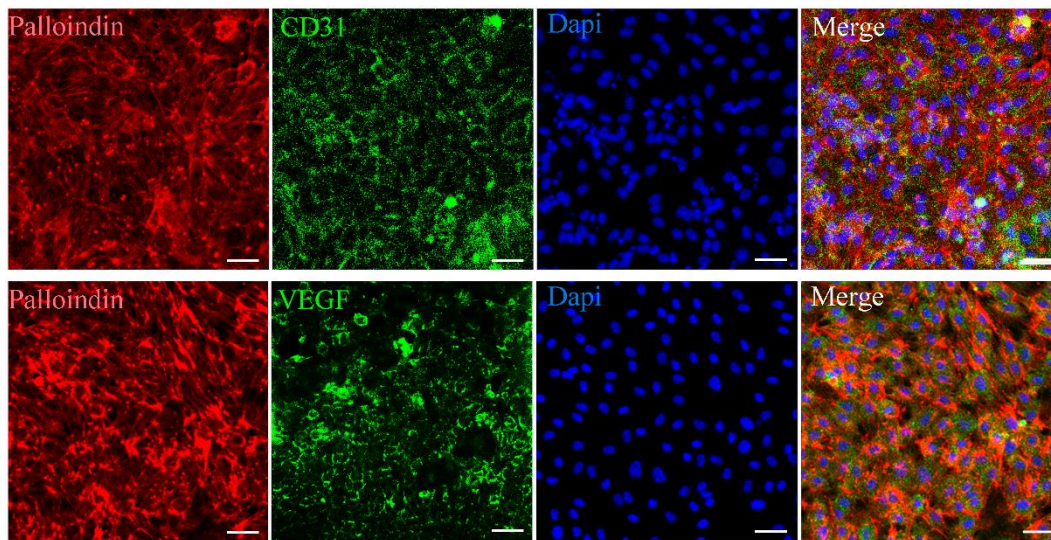


Figure S9. Immunofluorescence (scale bar: 0.05 mm) staining of PI (red), VEGF and CD31 (green), and nuclei staining (blue) of bioprinted HUVECs in AG-ACuMBGN on day 21.

**Table S1. BMSCs cells related gene primer pairs used in the RT-qPCR.**

Genes	Primer sequences
ALP	Forward:5'- GAACAGACCCTCCCCACGAG-3'
	Reverse:5'- GTGCCGATGGCCAGTACTAA -3'
BMP2	Forward:5'- CAAAGCAGGACCAGTGGGAA-3'
	Reverse:5'- AGCCCCCTGGAAGGGATTAT-3'
RUNX2	Forward:5'- AACCACAAGTGCGGTGCAA-3'
	Reverse:5'- GCAGCCTTAAATGACTCGGTT-3'
ANG	Forward:5'- CACCCATATCGGGGACGAGA-3'
	Reverse:5'- CAGACCCAGCACGAAGATCA-3'
VWF	Forward:5'- ACAACTTGACAGCAGGTCGG-3'
	Reverse:5'- GAAACCCAGCCGCTACTCAG -3'
VEGFa	Forward:5'- TATTCAGCGGACTCACCAGC-3'
	Reverse:5'- AACCAACCTCCTCAAACCGT-3'
GAPDH	Forward:5'-CTCCCACTCTTCCACCTTCG -3'
	Reverse:5'-TTGCTGTAGCCGTATTCATT -3'