ADVANCED SCIENCE
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Supporting Information

for *Adv. Sci.*, DOI: 10.1002/advs.201901511

2D MXene-Integrated 3D-Printing Scaffolds for Augmented Osteosarcoma Phototherapy and Accelerated Tissue Reconstruction

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Supporting information for

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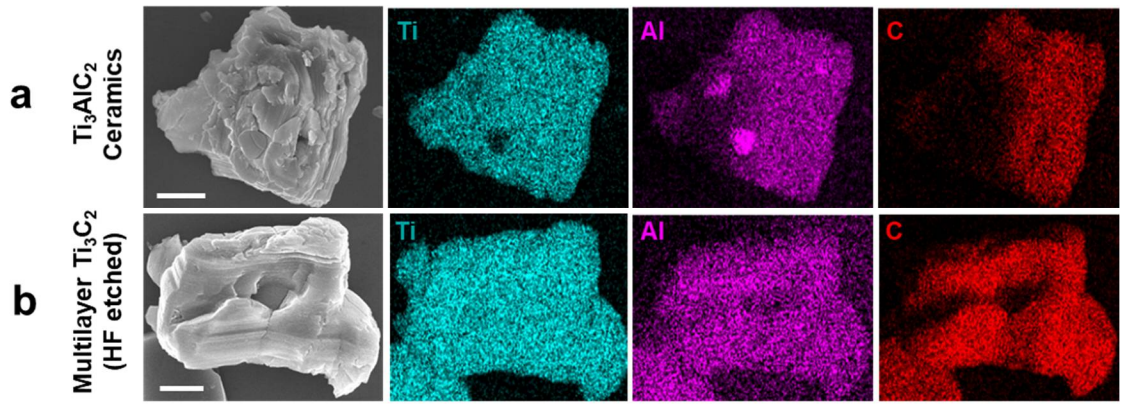
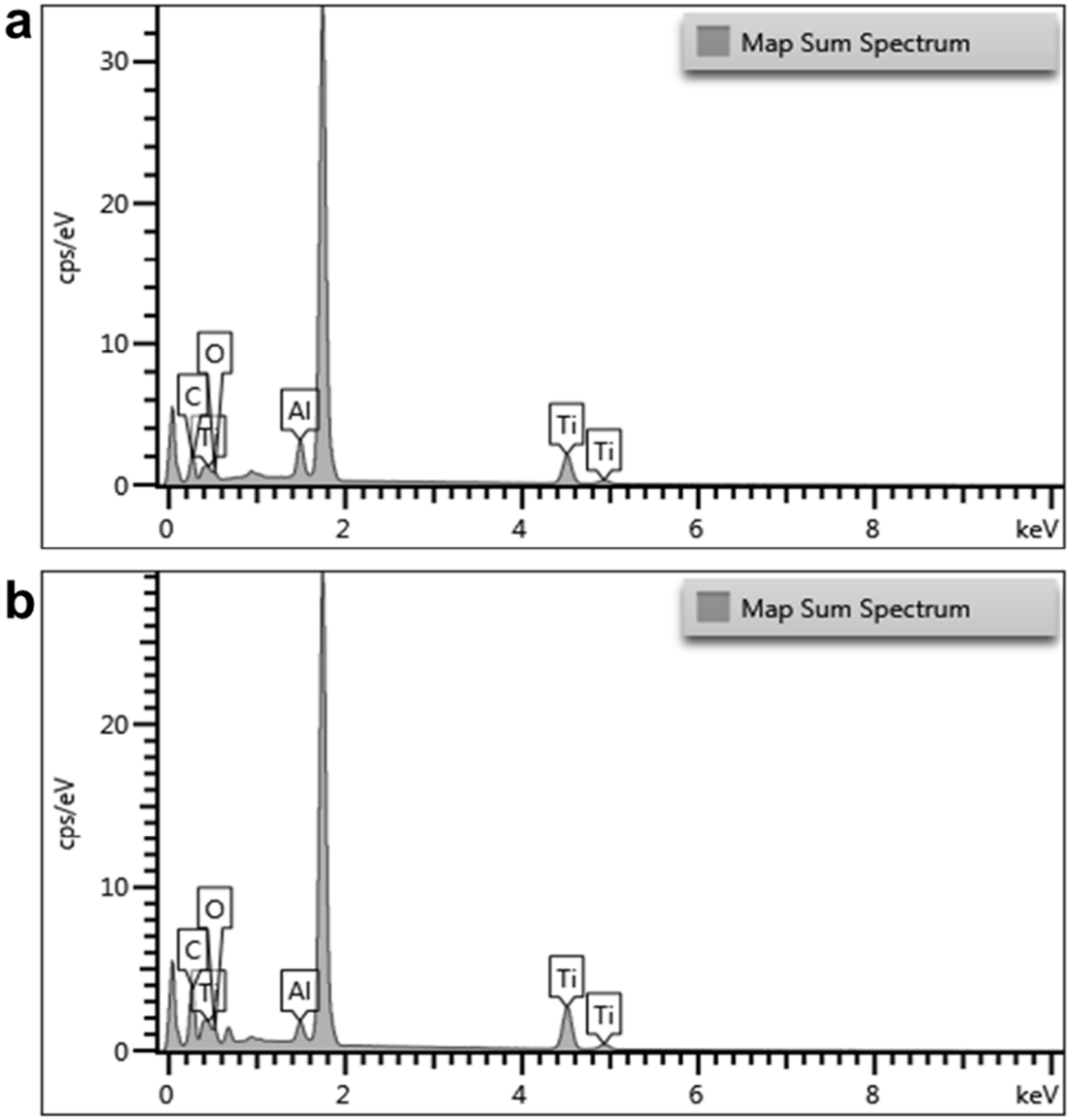
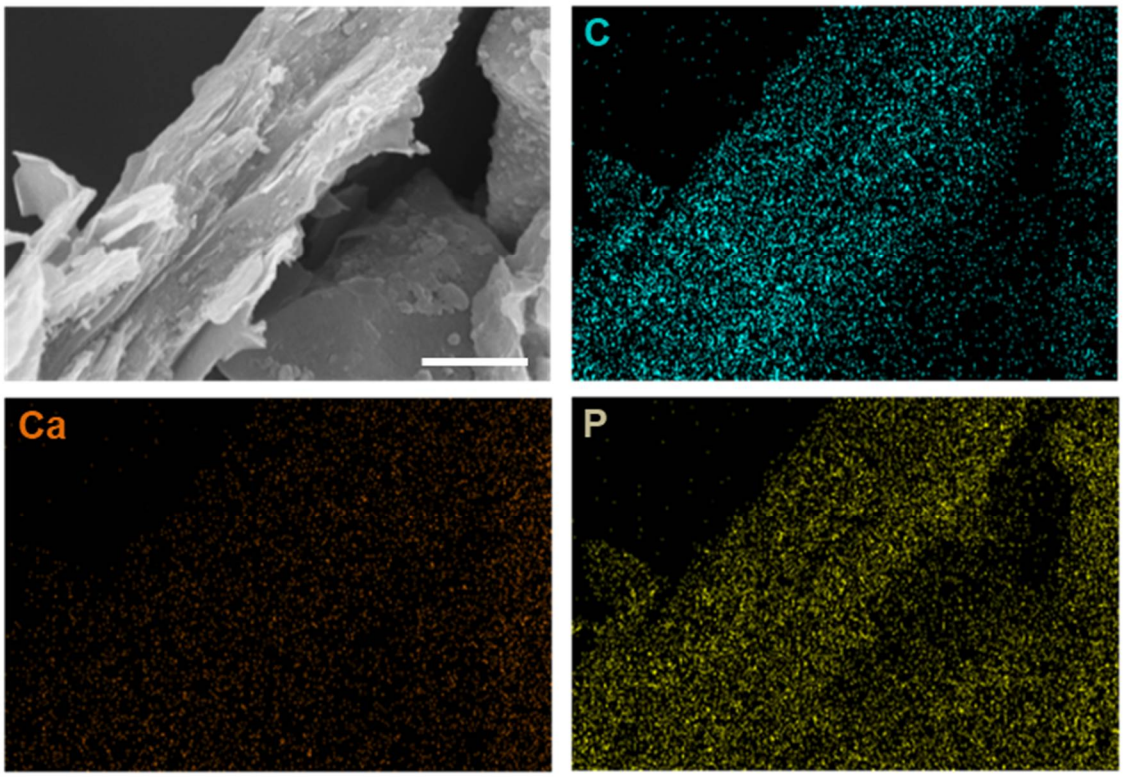
Supplementary figures



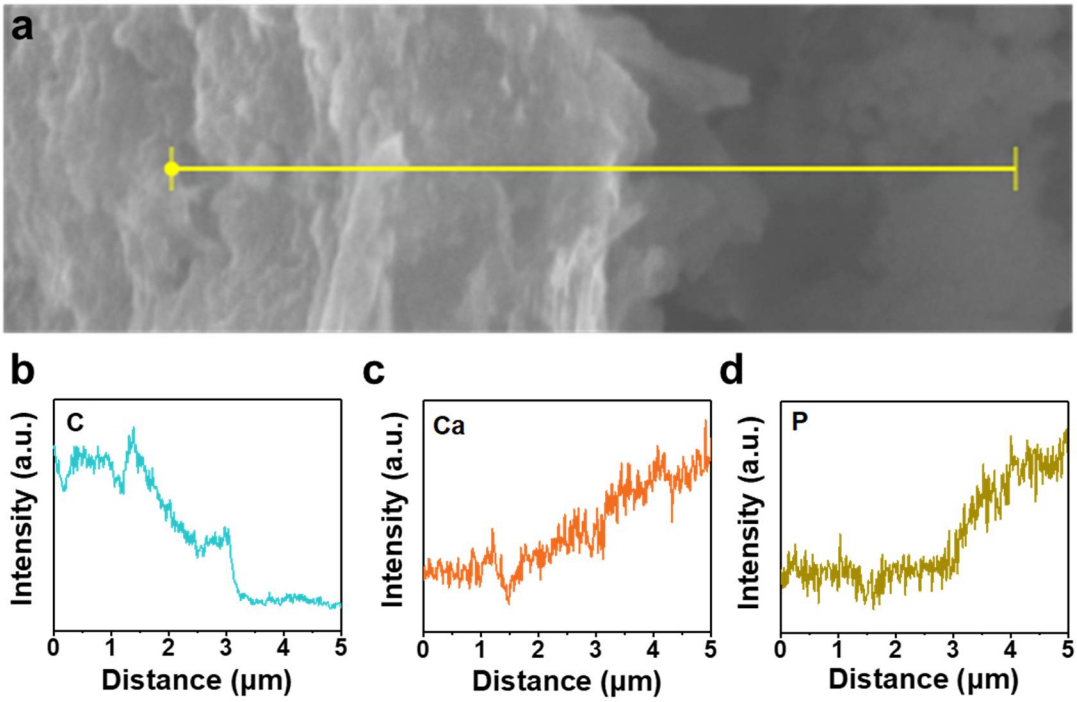
Supplementary Figure S1. Elemental mapping for Ti_3AlC_2 ceramic and multilayer Ti_3C_2, scale bar is 1 μm.



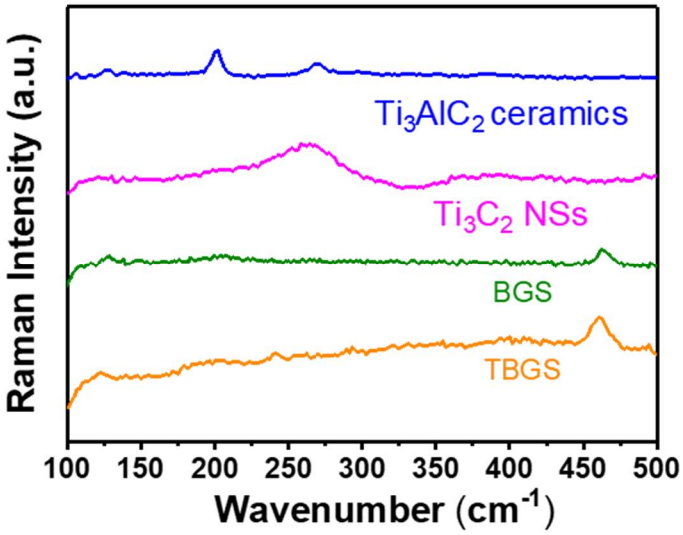
Supplementary Figure S2. (a) EDS profile confirming the presence of Ti, Al and C elements in Ti_3AlC_2 ceramic on **Supplementary Figure S1**. The atomic content of Ti, Al and C elements are 44.3%, 14.8% and 34.0%, respectively. **(b)** EDS profile confirming the presence of Ti, Al and C elements in HF-etched Ti_3AlC_2 (multilayer Ti_3C_2) on **Supplementary Figure S1**. The atomic percent of Ti, Al and C elements are 40.5%, 5.5% and 43%, respectively.



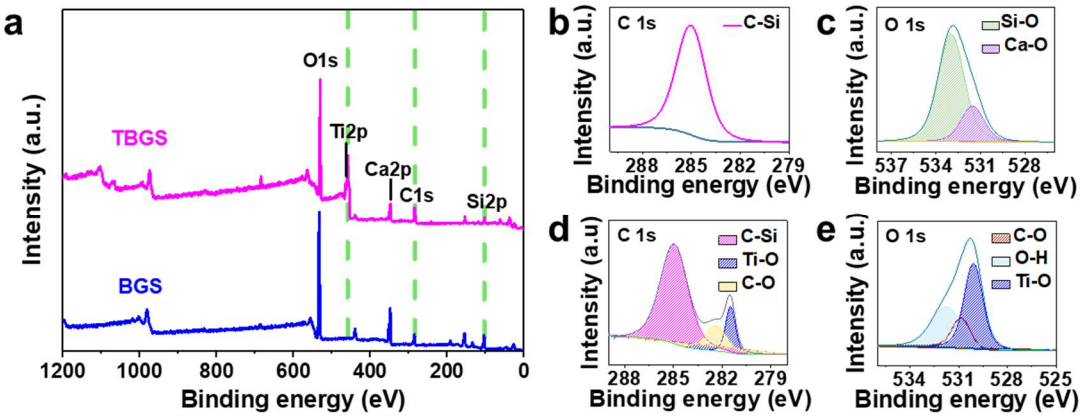
Supplementary Figure S3. SEM image and the corresponding elemental mapping for cross-section of TBGSs (scale bar: 1 μm).



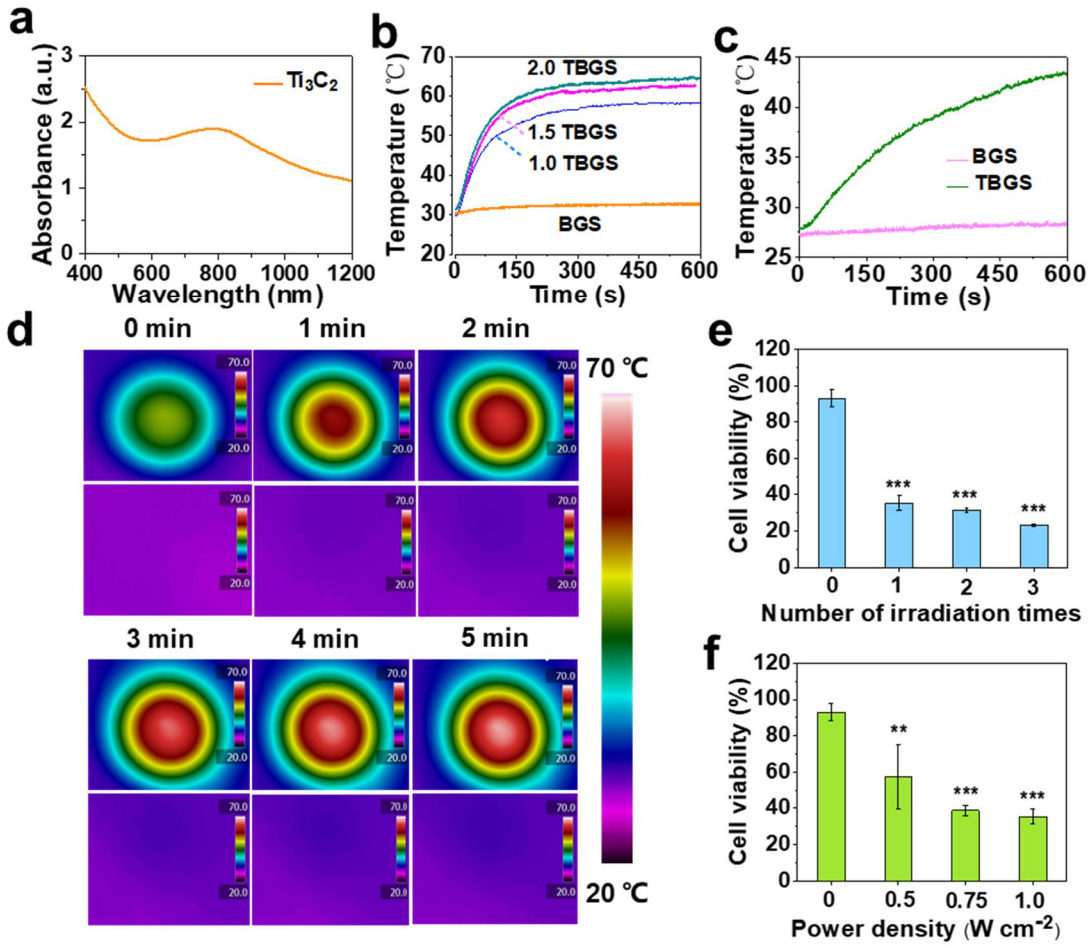
Supplementary Figure S4. EDS linear scanning of the interface of TBGSs for C, Ca, and P elements.



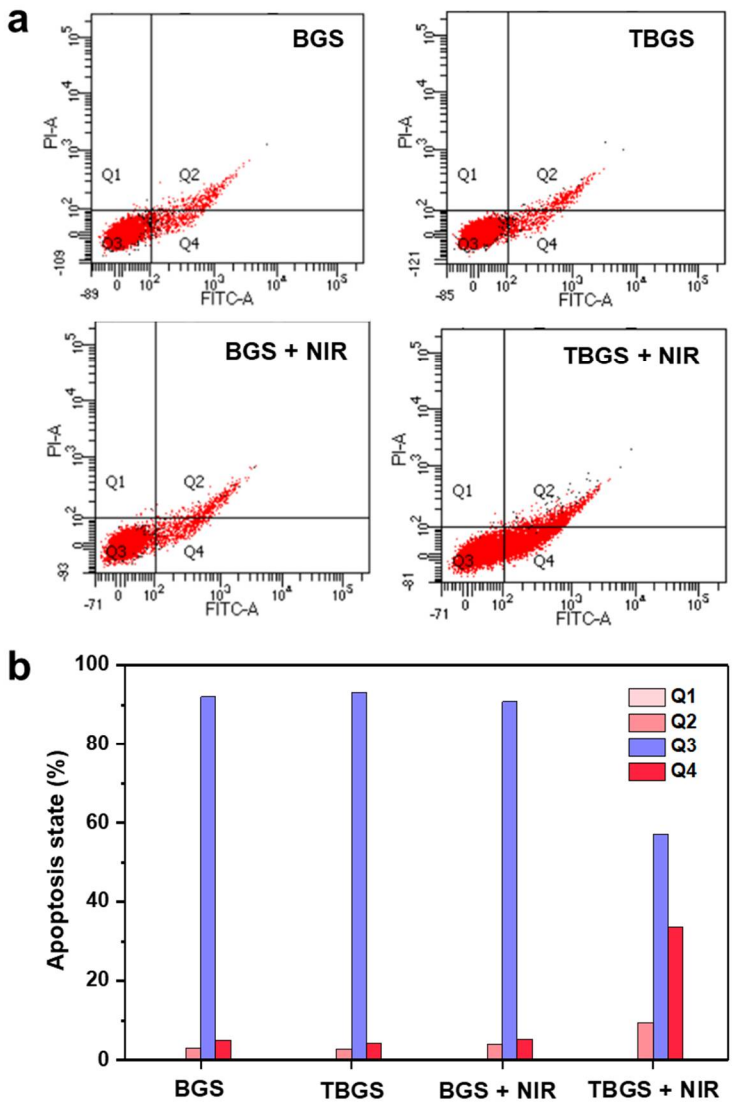
Supplementary Figure S5. Raman spectra of Ti_3AlC_2 bulk ceramic, Ti_3C_2 NSs, pure BGSs and TBGSs.



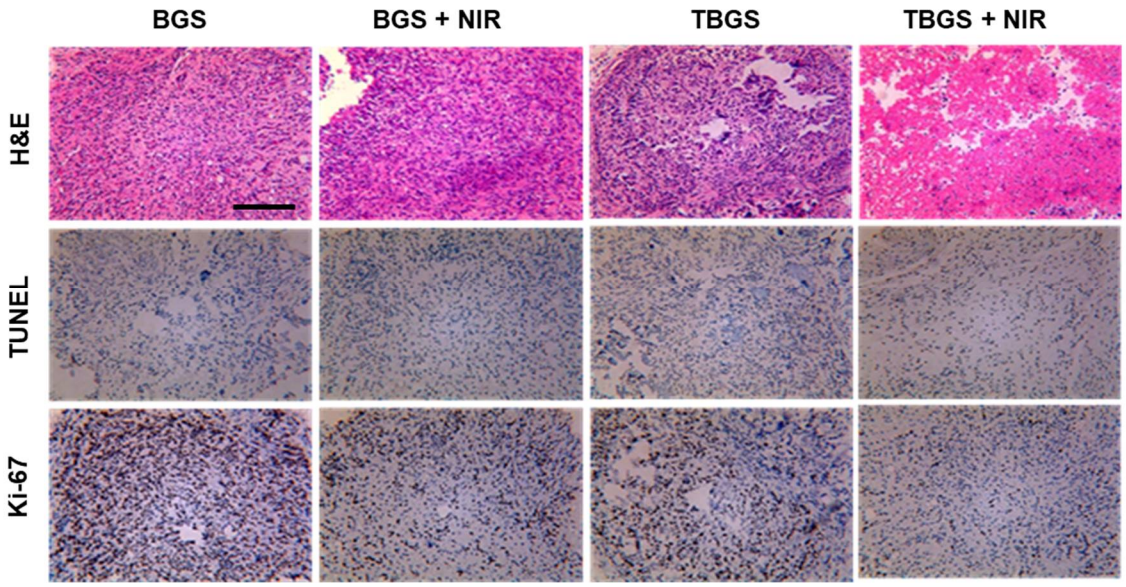
Supplementary Figure S6. (a) XPS spectra of pure BGS and TBGS in the area including all possible elements. **(b)** C 1s peak of pure BGSs. **(c)** O 1s peak of pure BGSs. **(d)** C 1s peak of TBGSs. **(e)** O 1s peak of TBGSs.



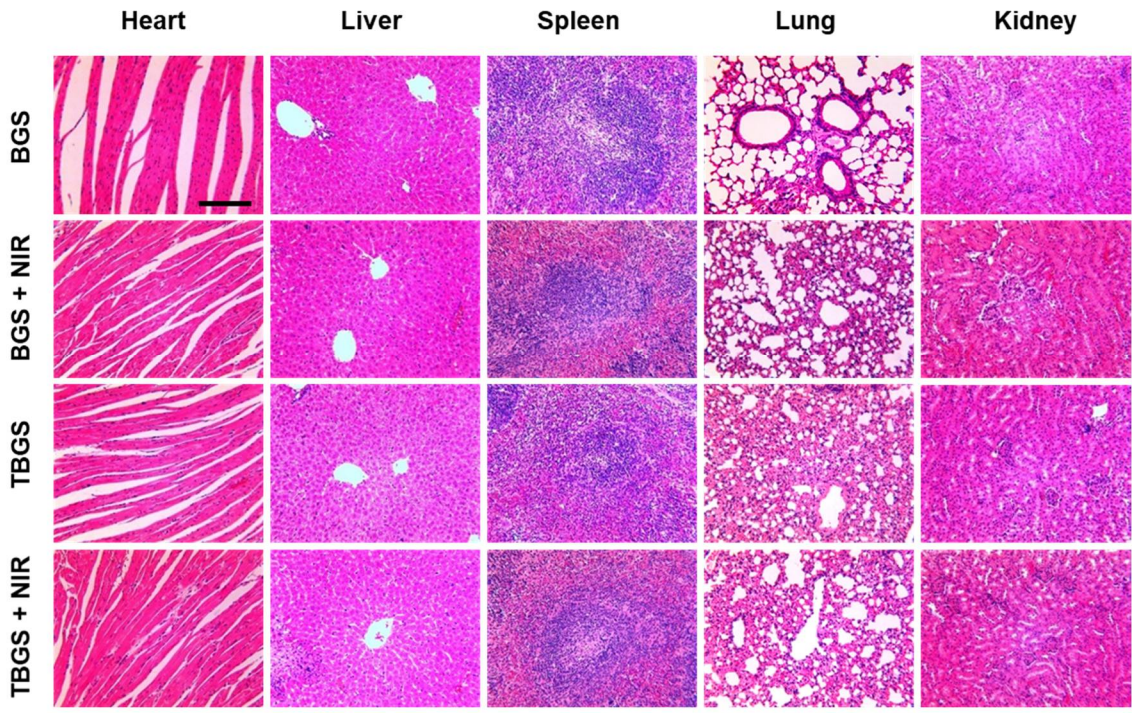
Supplementary Figure S7. (a) UV-vis-NIR spectrum of Ti_3C_2 NSs. **(b)** Photothermal heating curves in air of pure BGS and TBGSs. **(c)** Photothermal heating curves in PBS of pure BGS and TBGSs. **(d)** Thermal images of BGS and 1.0 TBGSs irradiated by 808 nm laser at the power density of 1.0 W cm^{-2}. **(e)** Relative cell viability of Saos-2 cells treated with 1.0 TBGSs for different irradiation durations. n = 4. **(f)** Relative cell viability of Saos-2 cells treated with 1.0 TBGSs for different power densities. n = 4. **p < 0.01, *** p < 0.001.



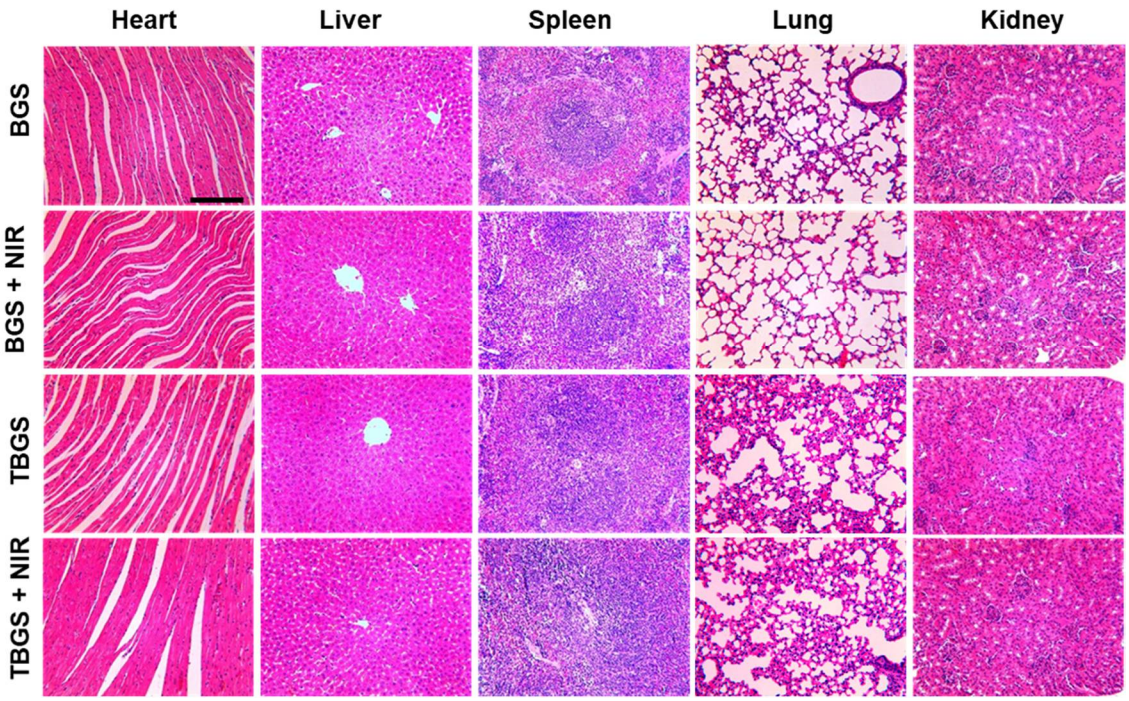
Supplementary Figure S8. (a) Apoptosis flow cytometry assay of Saos-2 cells on BGSs/TBGSs with/without laser irradiation. Region Q1, Q2, Q3, Q4 represent dead cells, late apoptotic cells, live cells, and early apoptotic cells, respectively. **(b)** Corresponding quantitative analysis of Saos-2 cells at different stages. In BGS group, the number of cells in region Q1, Q2, Q3, Q4 is 0.1%, 3.0%, 92% and 4.9%, respectively. In TBGS group, the number of cells in region Q1, Q2, Q3, Q4 is 0.0%, 2.8%, 93% and 4.2%, respectively. In BGS + NIR group, the number of cells in region Q1, Q2, Q3, Q4 is 0.1%, 4.0%, 90.8% and 5.2%, respectively. In TBGS + NIR group, the number of cells in region Q1, Q2, Q3, Q4 is 0.1%, 9.4%, 57% and 33.5%, respectively.



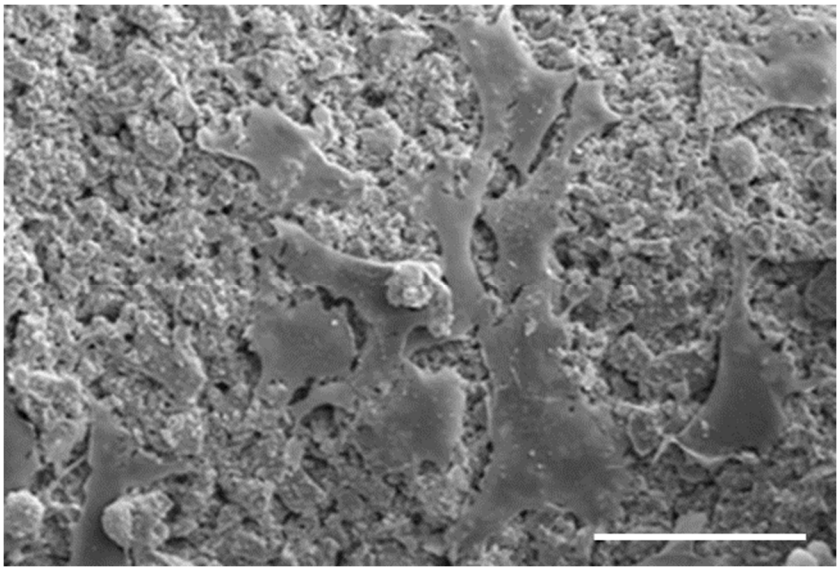
Supplementary Figure S9. Histological sections of tumors after different treatments at the 1st day (scale bar: 100 μm).



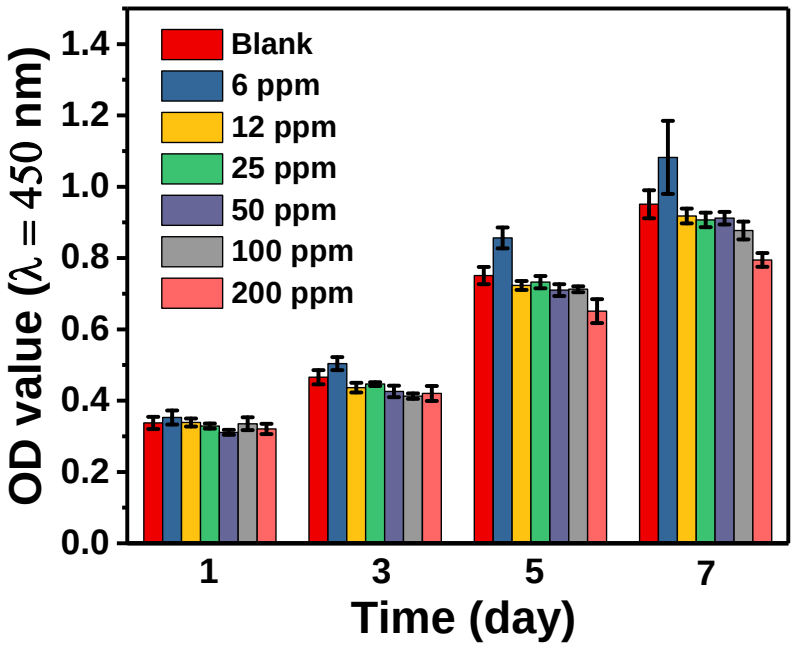
Supplementary Figure S10. Histological observation of major organs from mice bearing tumors after different treatments at the 1st day (scale bar: 100 μm).



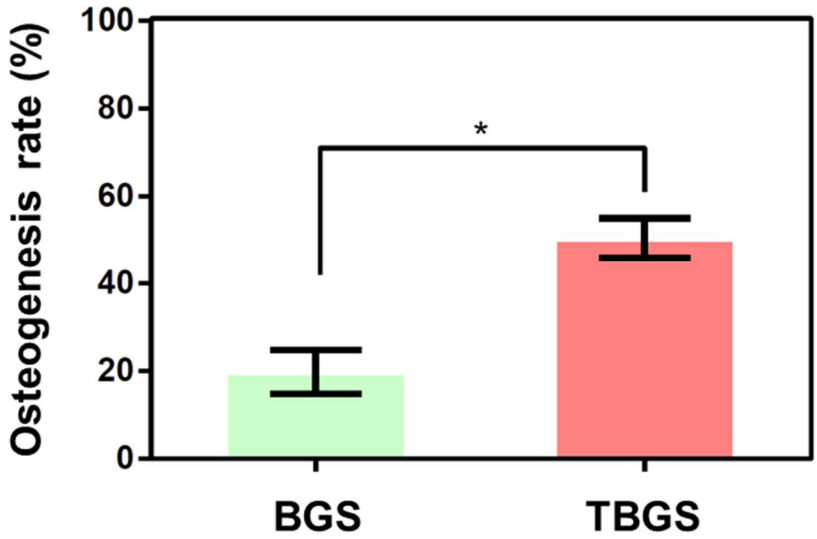
Supplementary Figure S11. Histological observation of major organs from mice bearing tumors after different treatments at the 28th day (scale bar: 100 μm).



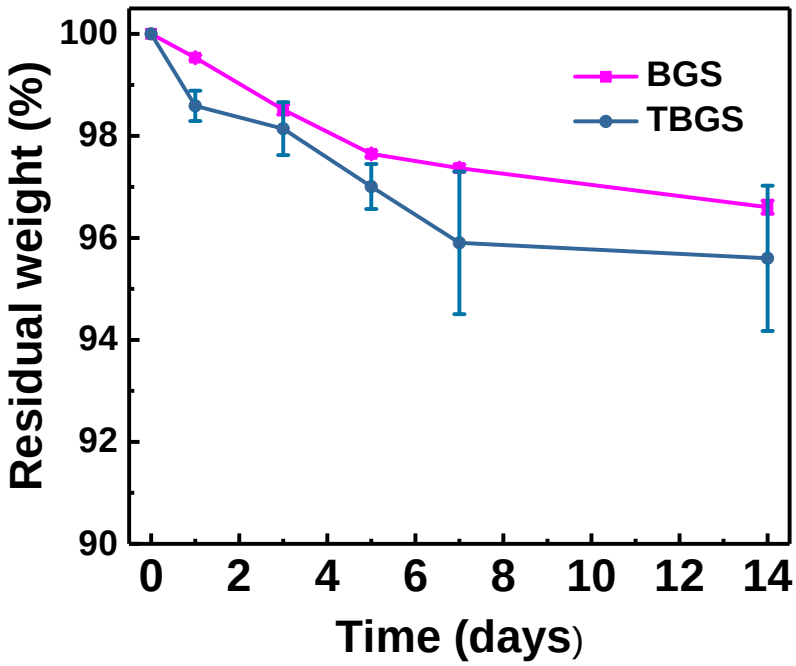
Supplementary Figure S12. SEM image of hBMSCs after seeding on 1.0 TBGS for 1 day (scale bar: 50 μm).



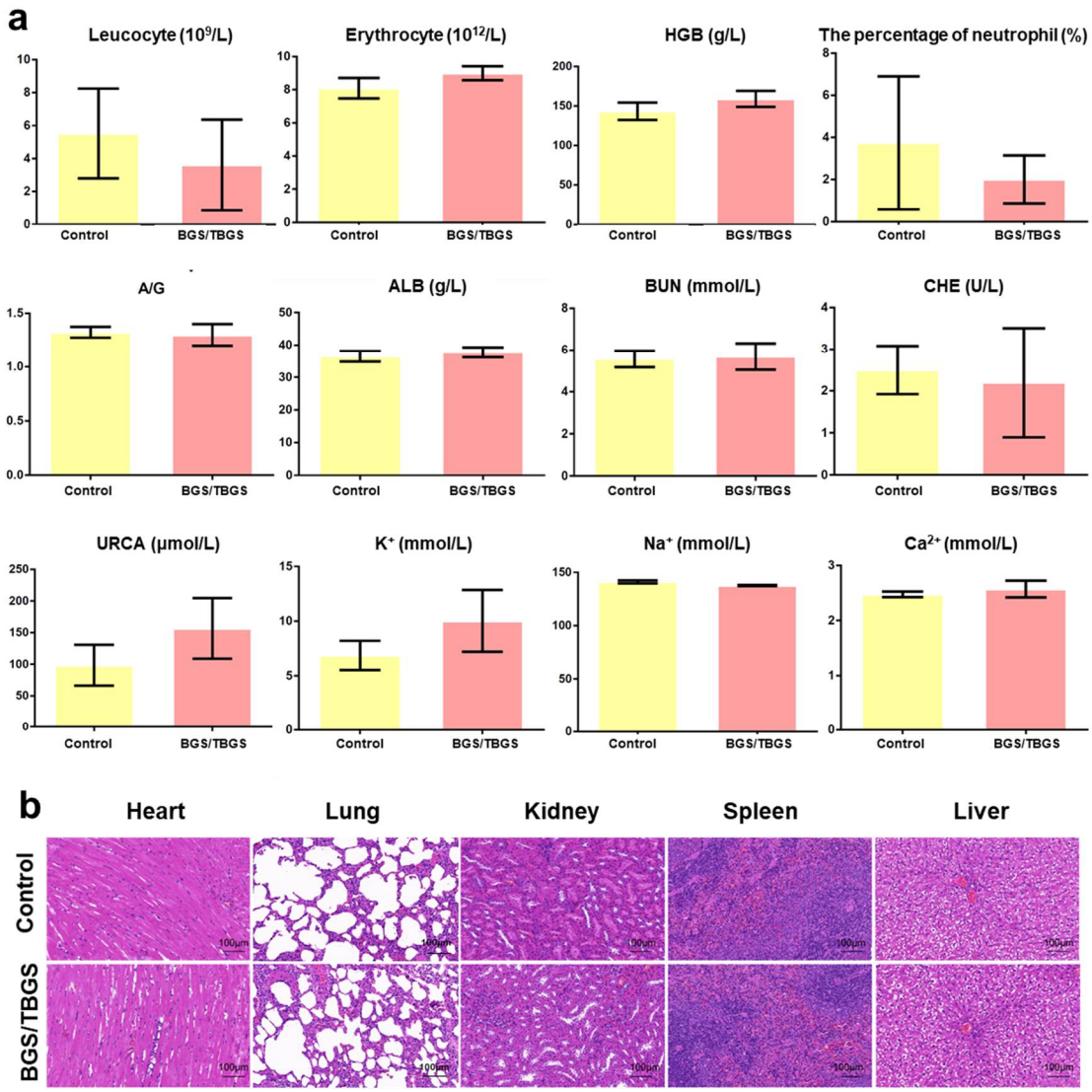
Supplementary Figure S13. CCK-8 data of BMSCs incubated with Ti_3C_2 NSs for 7 days (n = 4).



Supplementary Figure S14. The osteogenesis rate of BGSs and TBGSs. The graph shows the percentage of each fluorochrome area for different groups in **Figure 7** (n = 4, *p < 0.05).



Supplementary Figure S15. Degradation of BGSs and TBGSs soaked in simulated body fluid for 14 days at 37 □ (n = 3).



Supplementary Figure S16. (a) Hematological assay of SD rats implanted with BGS/TBGS compared to the control group. n = 6. **(b)** H&E stain of major organs of BGS/TBGS group and control group. There were no significant differences between the two groups at week 24 (scale bar: 100 μm).