# Supplementary Information

**Ultrasound-controlled MXene-based Schottky heterojunction improves anti-infection and osteogenesis properties.**

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**Figure captions**

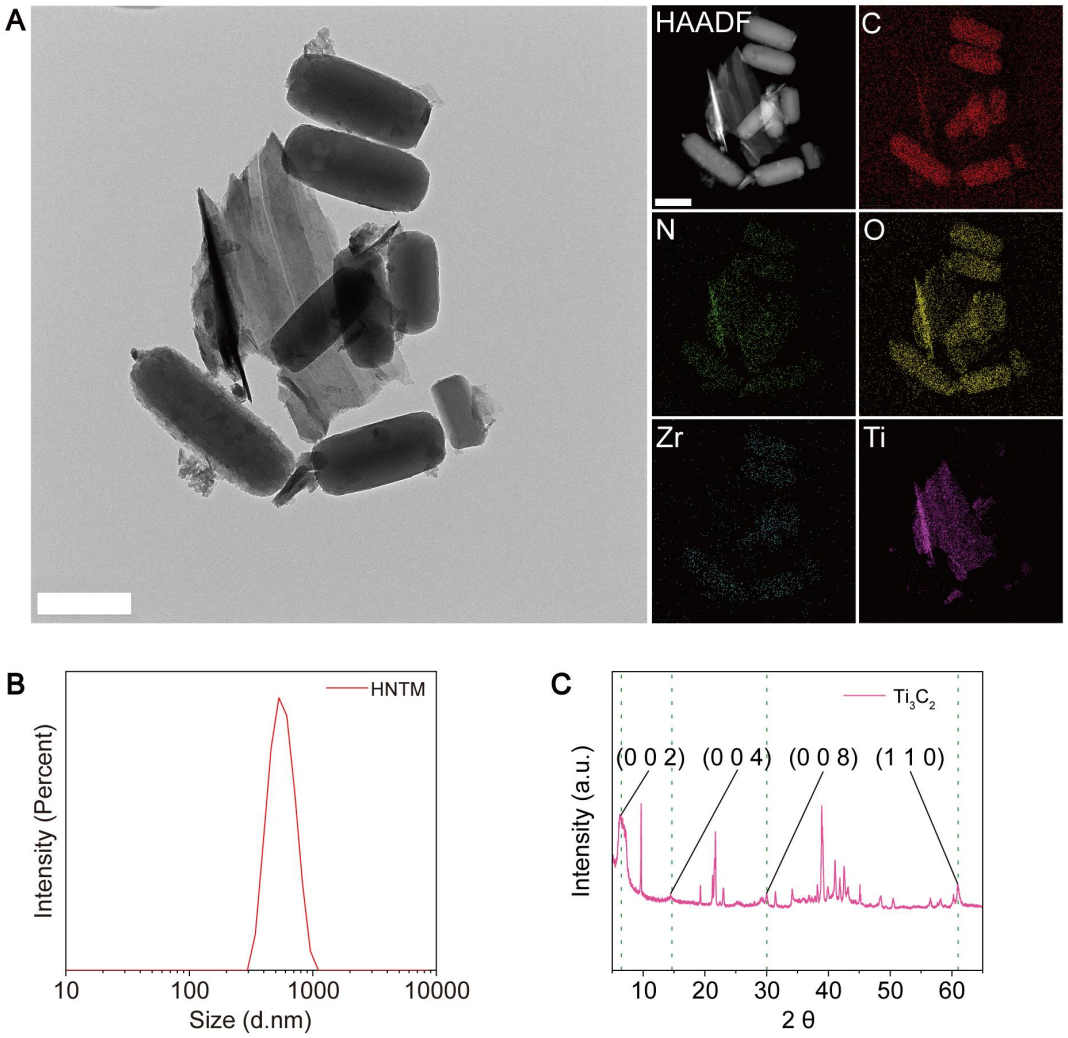


**Figure S1.** (A) TEM image and Energy-dispersive X-ray spectroscopy elemental mapping of HN-$Ti_3C_2$ after 7 days of immersion in PBS solution. Scar bar: 500 nm. (B) Dynamic light scattering (DLS) size distribution of HNTM. (C) XRD pattern of $Ti_3C_2$.

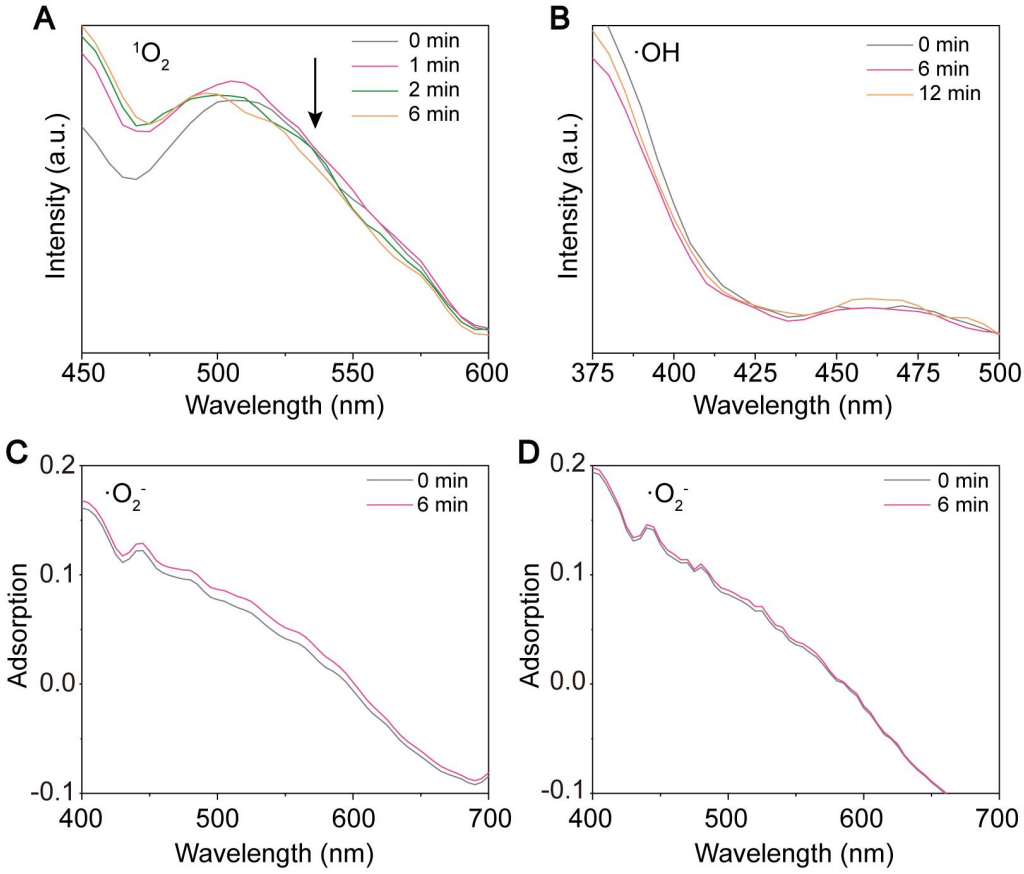


**Figure S2.** (A) The $^1O_2$ generation of $Ti_3C_2$ under US detecting by the decrease of DMA fluorescence intensity. (B) The •OH generation of $Ti_3C_2$ under US detecting by the fluorescence spectra of TA. Adsorption of NBT treated by (C) HNTM or (D) $Ti_3C_2$ for 6 min under US.

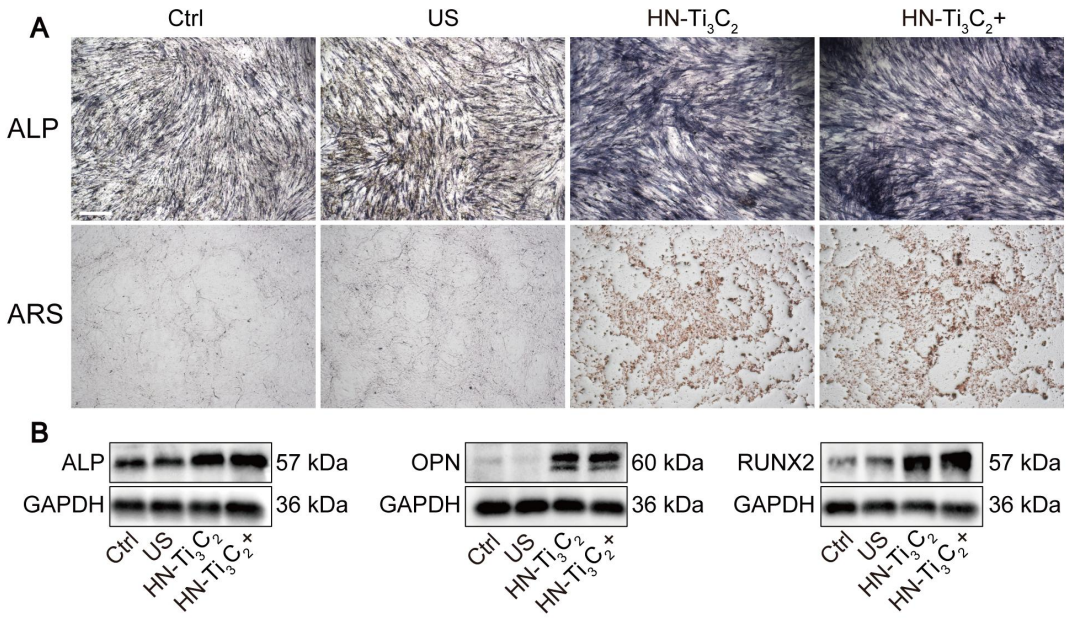


**Figure S3.** (A) ALP staining and ARS staining images of hBMSCs cultured in different conditions (Control, US, HN-$Ti_3C_2$ and HN-$Ti_3C_2$+US) after 14 days. Scar bar: 50 μm. (B) Western blot of ALP, OPN, and RUNX2 proteins of hBMSCs treated in different conditions (Control, US, HN-$Ti_3C_2$ and HN-$Ti_3C_2$+US) after 14 days.

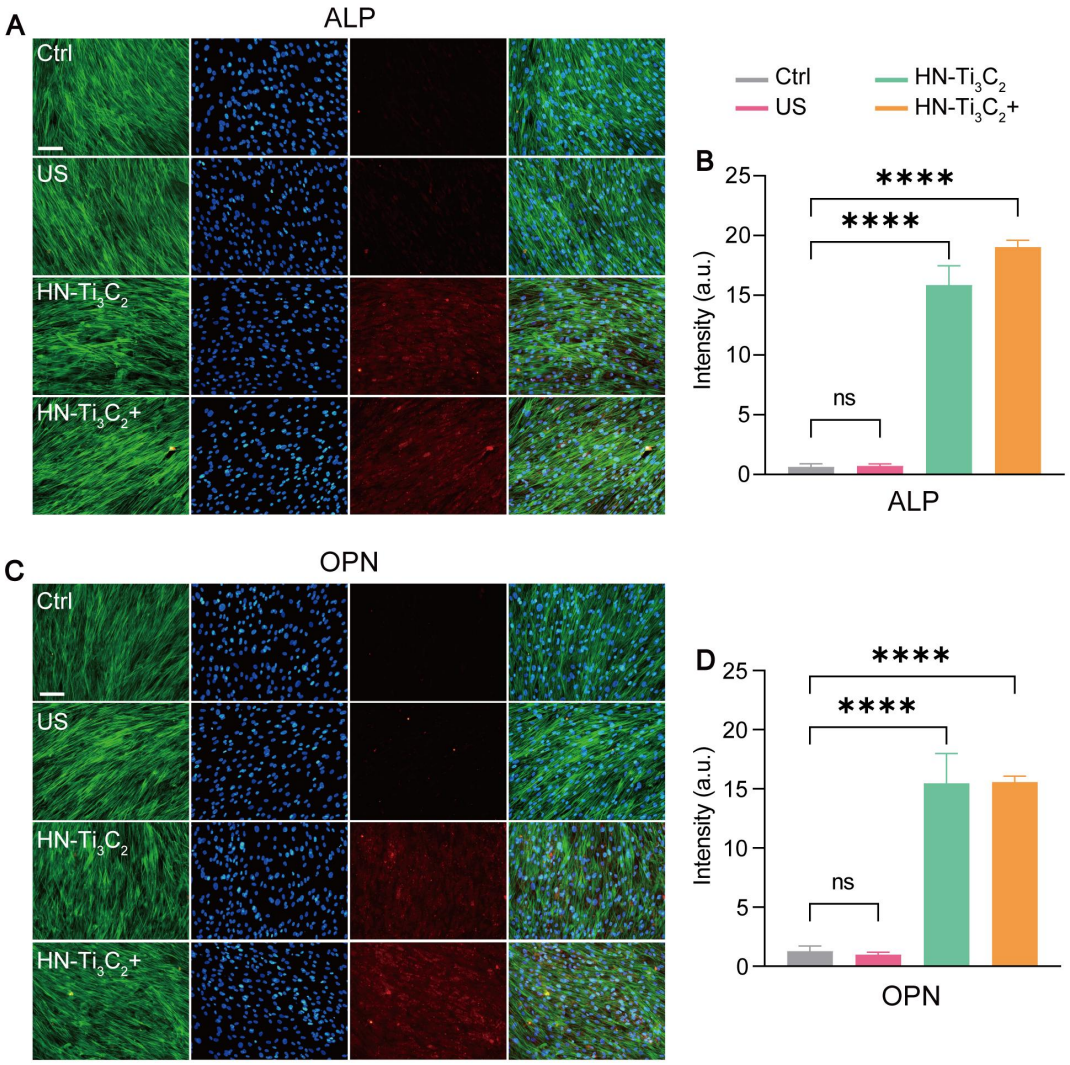


**Figure S4.** (A, C) ALP and OPN immunofluorescence staining images of hBMSCs cultured in different conditions (Control, US, HN-$Ti_3C_2$ and HN-$Ti_3C_2$+US) after 14 days (green fluorescence: cytoskeleton; blue fluorescence: nucleus; red fluorescence: ALP or OPN). Scar bar: 50 μm. Quantitative analysis of (B) ALP and (D) OPN fluorescence intensity after 14 days. n = 3 independent experiments per group, *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, ****$P < 0.0001$, ns = not significant.

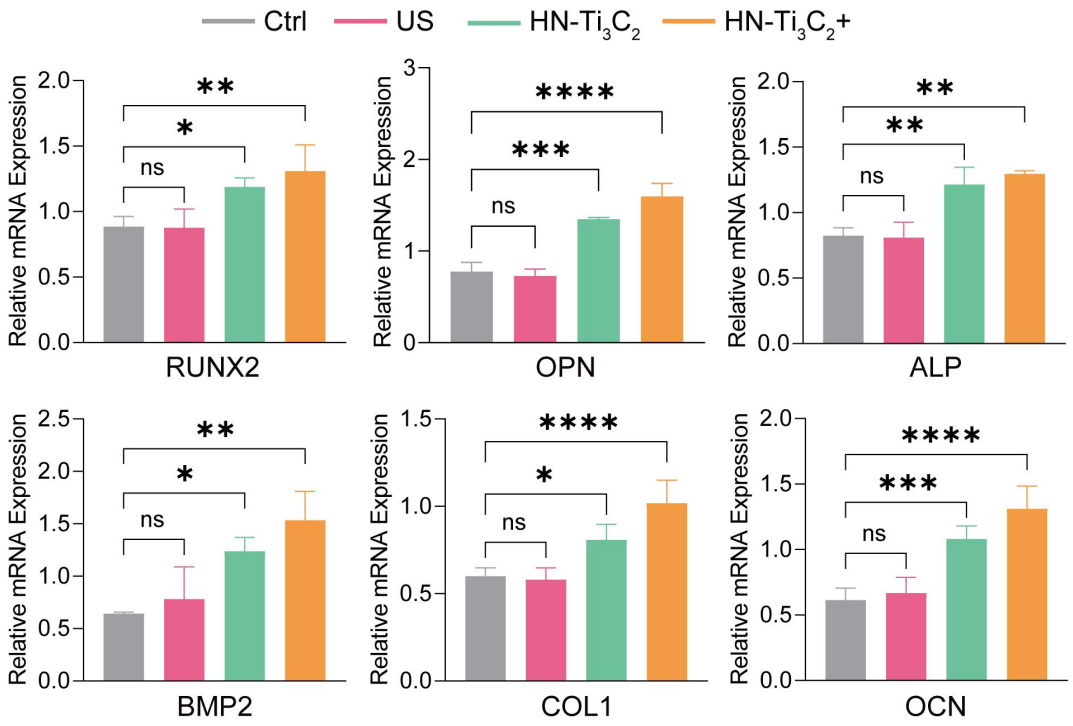


**Figure S5.** qRT-PCR results of RUNX2, OPN, ALP, BMP2, COL1 and OCN treated in different conditions (Control, US, HN-$Ti_3C_2$ and HN-$Ti_3C_2$+US) after 7 days. n = 3 independent experiments per group, *$P$ < 0.05, **$P$ < 0.01, ***$P$ < 0.001, ****$P$ < 0.0001, ns = not significant.

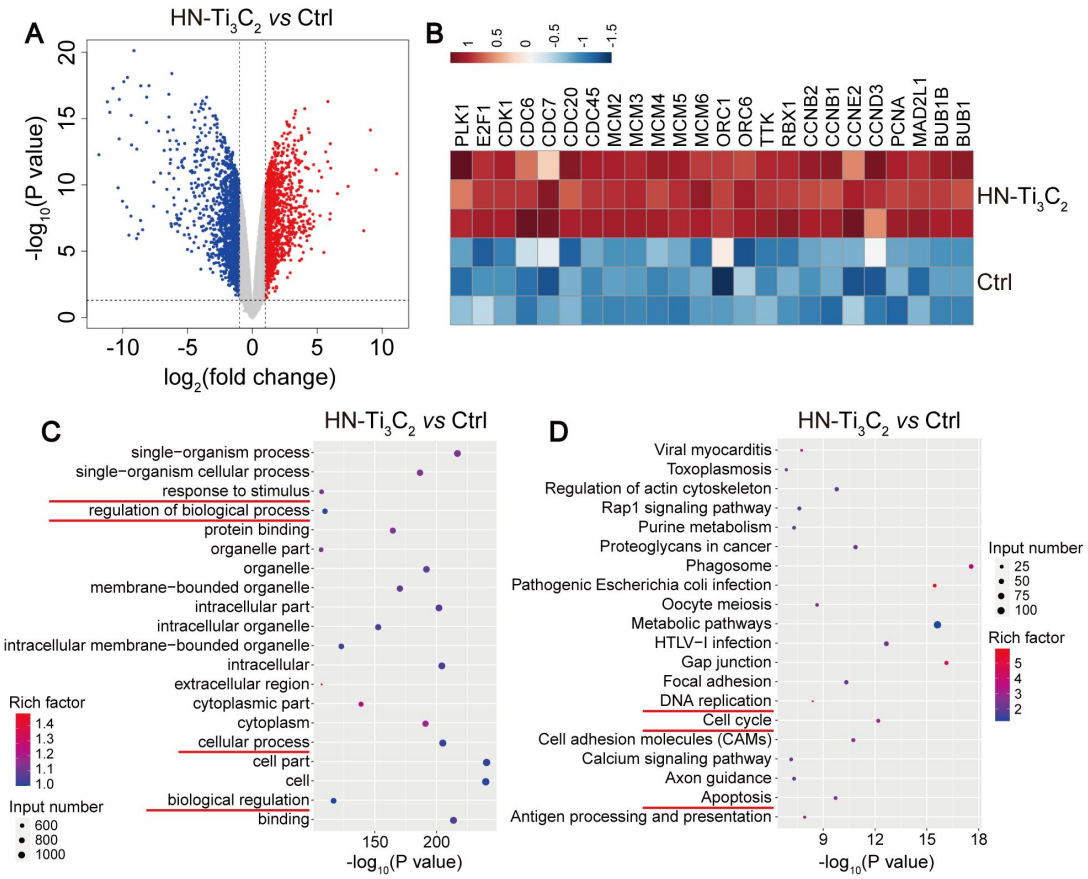


**Figure S6.** (A) Volcano plot of HN-$Ti_3C_2$ *vs* control. (B) Heatmap of cell cycle related genes. (C) The top 20 most significantly enriched GO pathways of HN-$Ti_3C_2$ *vs* control. (D) The top 20 most significantly enriched KEGG pathways of HN-$Ti_3C_2$ *vs* control. n = 3 independent experiments per group.

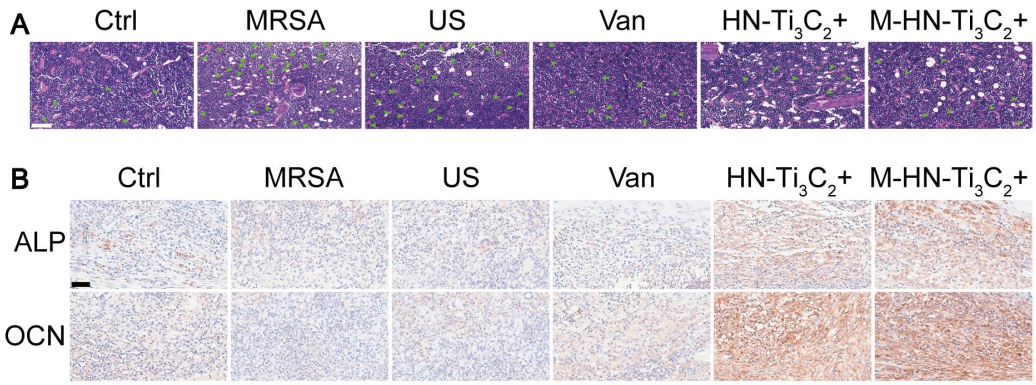


**Figure S7.** (A) HE staining of infected bone. Inflammatory cells are highlighted with green arrows. Scar bar: 100 μm. (B) Immunohistochemical staining of ALP and OCN. Scar bar: 50 μm.