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Supplementary Information

A periodontal tissue regeneration strategy via biphasic release of zeolitic imidazolate framework-8 and FK506 using a uniaxial electrospun Janus nanofiber

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Methods

Preparation of ZIF-8 nanoparticles

ZIF-8 nanoparticles (ZIF-8 NPs) was carried out at room temperature as reported, previously.[1] In brief, 1.17 g Zn $(NO)_3 \cdot 6H_2O$, dissolved in 8 g of deionized (DI) water was added to 22.7 g 2-methylimidazole dissolved in 80 g DI water. The reaction solution was stirred at room temperature for ~ 5 min. After that, the produce was isolated via centrifugation, washed with deionized DI water and dried in a vacuum oven. The morphology of ZIF-8 NPs was obtained by transmission electron microscopy (TEM, JOEL JEM-201). The information on the crystalline phase structure of ZIF-8 NPs was obtained by X-ray diffractometer (XRD, SmartLab SE). The functional groups of ZIF-8 NPs were measured by Fourier transform infrared spectrometer (FTIR, FTIR-650).

Results

Characterization of ZIF-8 NPs

The morphology of ZIF-8 NPs was rhombic dodecahedral in shape and the size distribution was 110.58±9.39 nm (Fig. S1-S2). The XRD pattern of the synthesized ZIF-8 NPs were in good agreement with the simulated crystal image, suggesting a pure phase of the synthesized ZIF-8 NPs (Fig. S3). The FT-IR spectrum showed the peak positions and their assignments agreed well with those reported in the literature (Fig. S4).[2] These results showed the successful synthesis of ZIF-8 NPs and can be used without further purification.

Figures

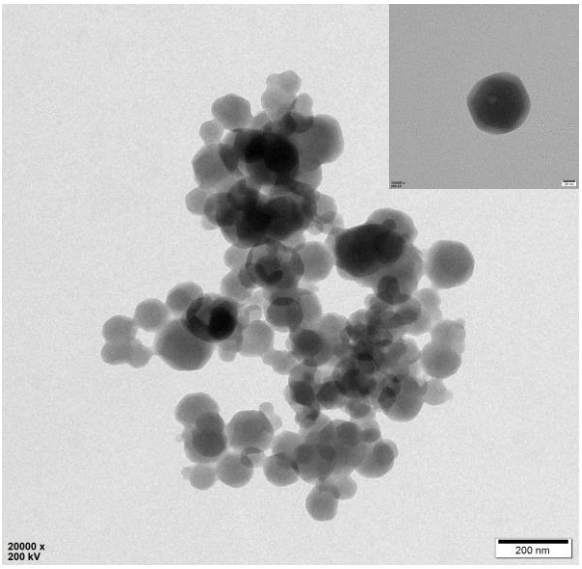

Fig. S1. TEM images of ZIF-8 NPs.

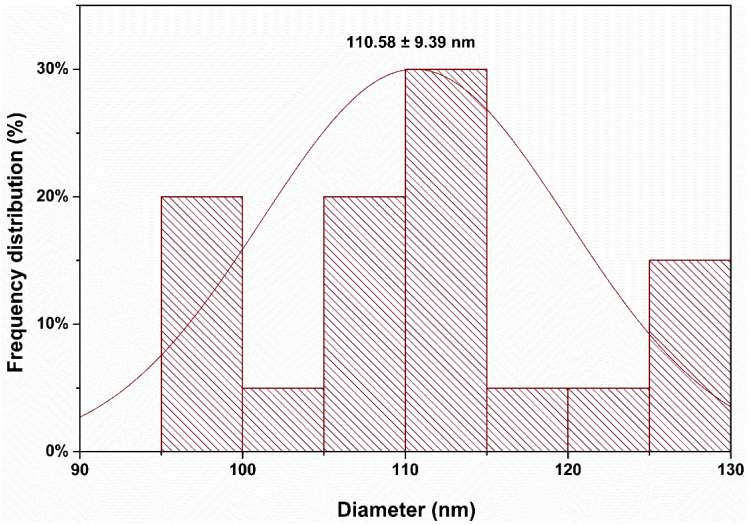

Fig. S2. Size distribution of the ZIF-8 NPs.

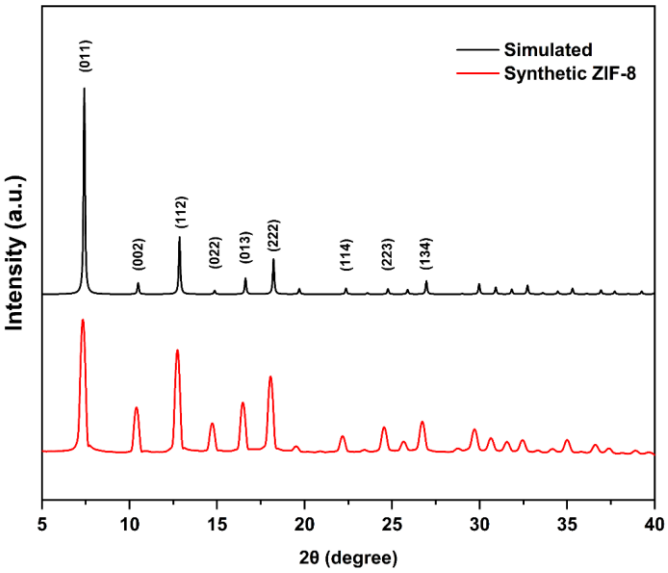

Fig. S3. XRD patterns of the ZIF-8 NPs.

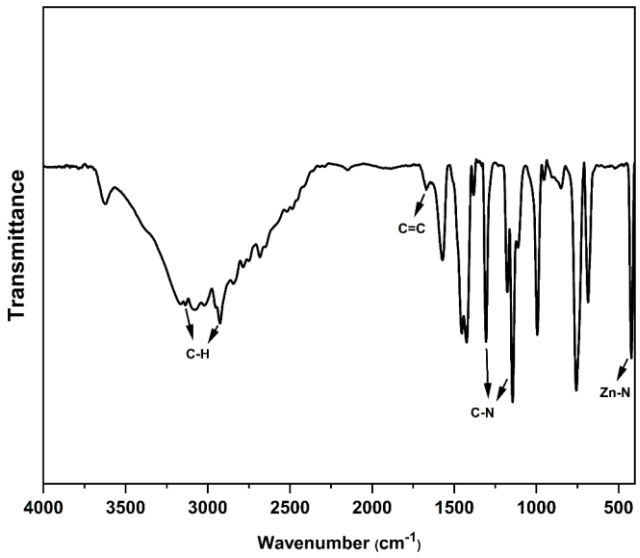

Fig. S4. FT-IR spectra of the ZIF-8 NPs.

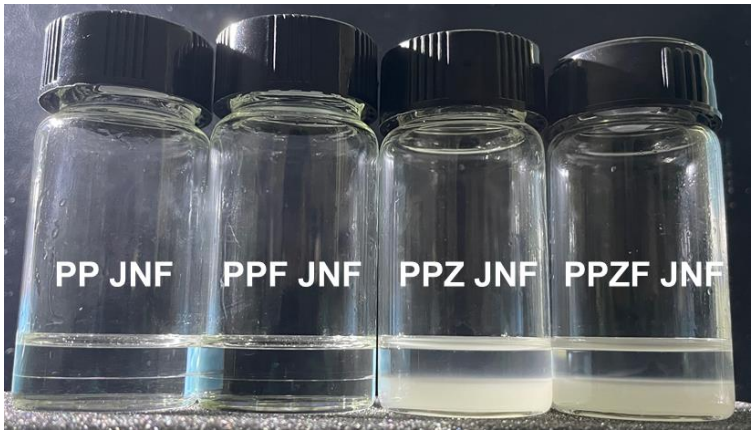

Fig. S5. The phase separation phenomenon in precursor solution.

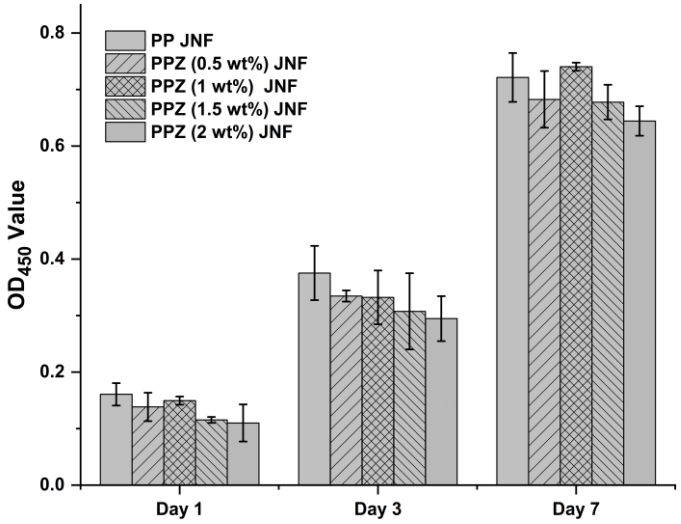

Fig. S6. Proliferation of BMSCs on PP Janus nanofibers and PPZ Janus nanofibers with different concentrations of ZIF-8 NPs. Data are presented as means ± SD. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

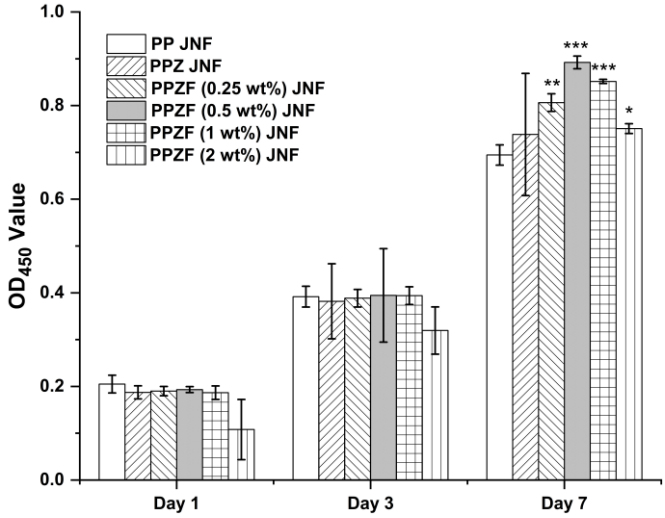

Fig. S7. Proliferation of BMSCs on PP Janus nanofibers, PPZ Janus nanofibers, and PPZF Janus nanofibers with different concentrations of FK506. Data are presented as means ± SD. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

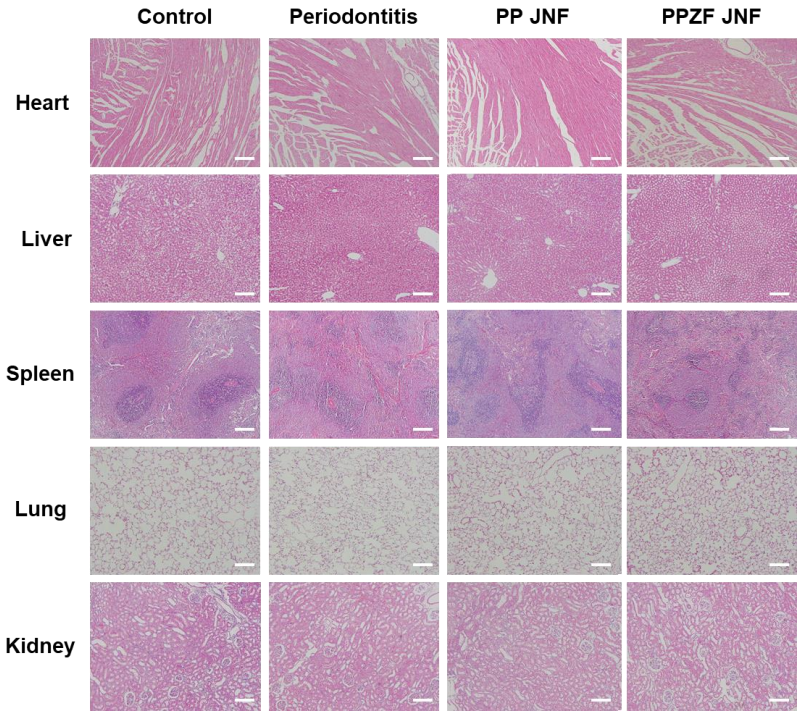

Fig. S8. H&E staining of vital organs including hearts, livers, spleens, lung and kidneys. Scale bar is 10 μm.

Table

Table S1. Primer Sequences of the Genes Involved in this Study

primer	sequence (5′ to 3′)
rat-*β-actin*-F	GGAGATTACTGCCCTGGCTCCTA
rat-*β-actin*-R	GACTCATCGTACTCCTGCTTGCTG
rat-*Runx2*-F	CATGGCCGGGAATGATGAG
rat-*Runx2*-R	TGTGAAGACCGTTATGGTCAAAGTG
rat-*Osx*-R	CATCCATGCAGGCATCTCA
rat-*Osx*-R	CTGCCCACCACCTAACCAA
rat-*Alp*-F	CATCGCCTATCAGCTAATGCACA
rat-*Alp*-R	ATGAGGTCCAGGCCATCCAG
rat-*Ocn*-F	TTATTGTTTGAGGGGCCTGGG
rat-*Ocn*-R	TGCTCCTACAAAGCTGTCTCC

References

1 Y. C. Pan, Y. Y. Liu, G. F. Zeng, L. Zhao, Z. P. Lai, *Chem. Commun.*, 2011, **47**, 2071-2073.

2 S. R. Venna, M. A. Carreon, *J. Am. Chem. Soc.*, 2010, **132**, 76−78.