

Supporting Information

Tandem post-synthetic modification of a zeolitic imidazolate framework for CXCR4-overexpressed esophageal squamous cell cancer imaging and therapy

Yi Cao ^{‡, a}, Zhenqi Jiang ^{‡, a, c}, Yanying Li ^{a, c}, Yinjie Wang ^{a, c}, Yong Yang ^b, Ozioma Udochukwu Akakuru ^{a, c}, Juan Li ^{*, a}, Aiguo Wu ^{*, a}

^a Cixi Institute of Biomedical Engineering, CAS Key Laboratory of Magnetic Materials and Devices, Key Laboratory of Additive Manufacturing Materials of Zhejiang Province, Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, Ningbo 315201, P.R. China

^b Department of Clinical Laboratory, the Affiliated Hospital of Medical School of Ningbo University, Ningbo University School of Medicine, Ningbo, 315010, P.R. China

^c University of Chinese Academy of Sciences, Beijing 100049, P.R. China

Email: aiguo@nimte.ac.cn
lij@nimte.ac.cn

[‡] These authors contributed equally.

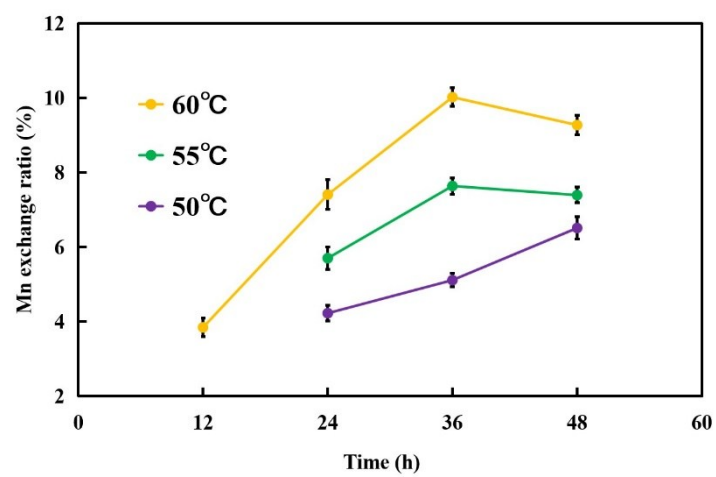


Fig. S1 Mn exchange ratio under different reaction times and temperatures with 3:1 molar ratio of Mn^{2+} to ZIF-7.

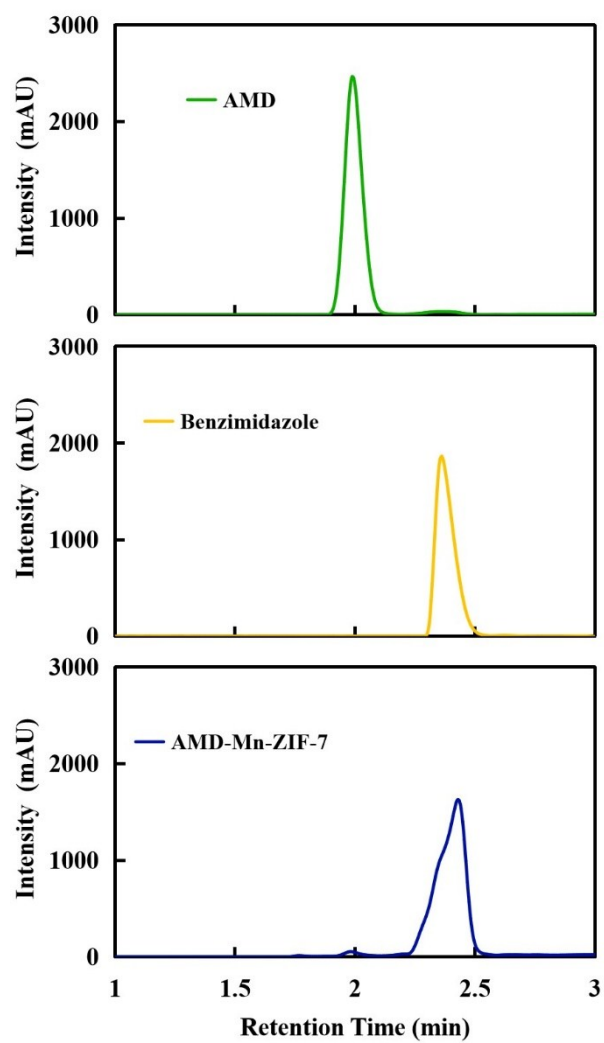


Fig. S2 HPLC figures of AMD, Benzimidazole, and AMD-ZIF-7(Mn) treated with HCl.

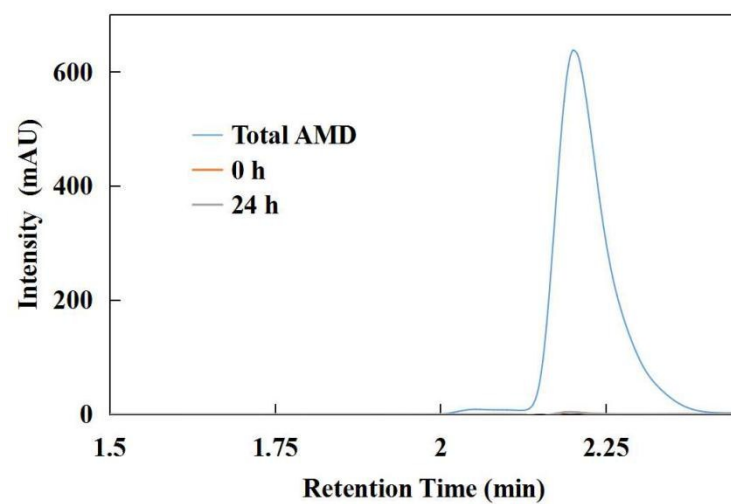


Fig. S3 HPLC figures of total AMD and the supernatant after 0 h and 24 h dispersion in PBS.

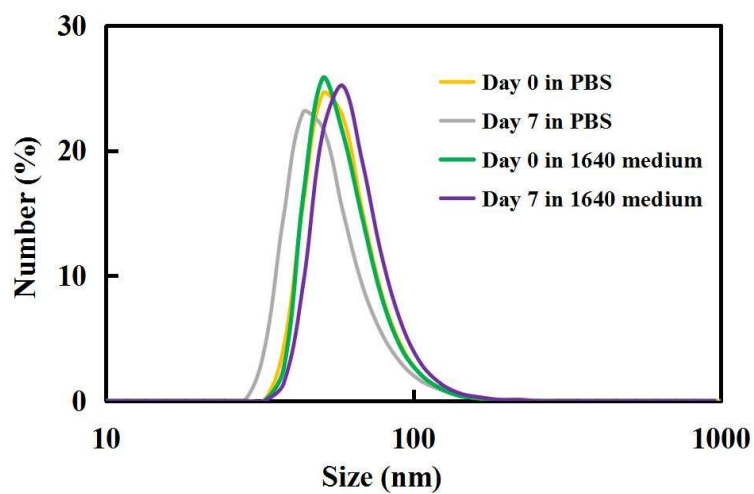


Fig. S4 Stability of the resulting AMD-ZIF-7(Mn)/5-Fu in 100 % 1640 medium and 1 × PBS, respectively, by monitoring particle size over 7 days.

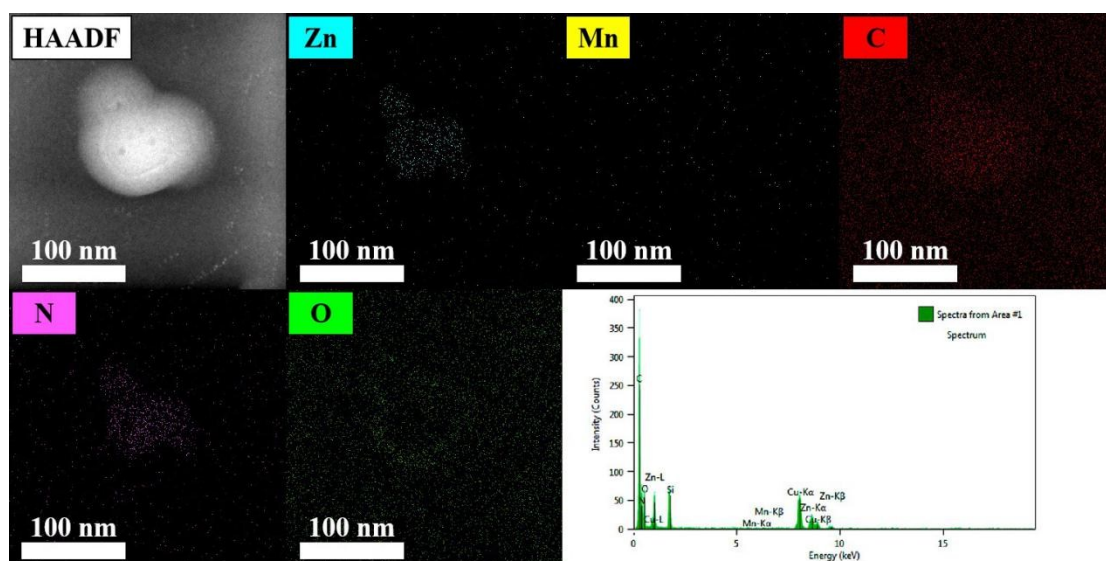


Fig. S5 STEM elemental mapping of Zn, Mn, C, N, O, and EDS spectrum of ZIF-7.

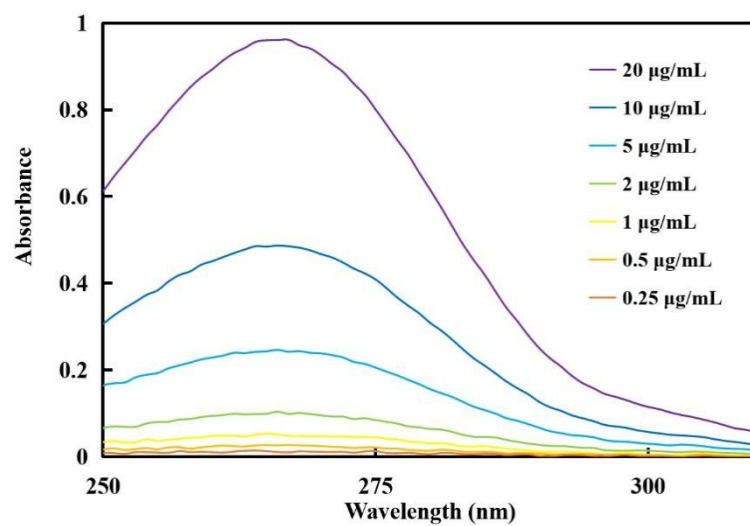


Fig. S6 UV-Vis spectra of 5-Fu at different concentrations.

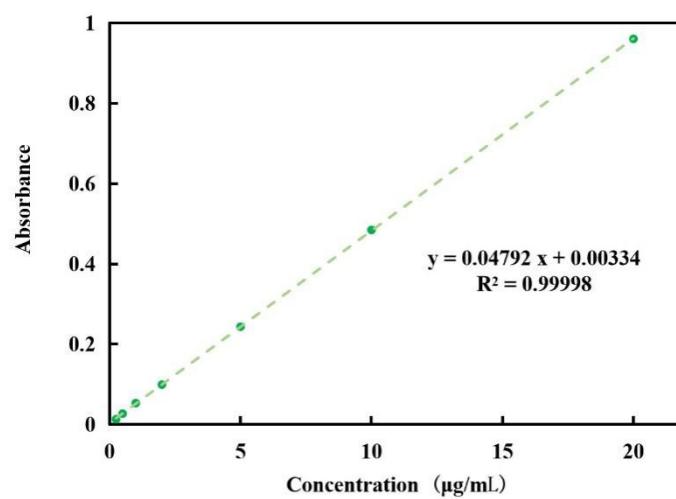


Fig. S7 Standard curve of 5-Fu from UV-Vis spectra.

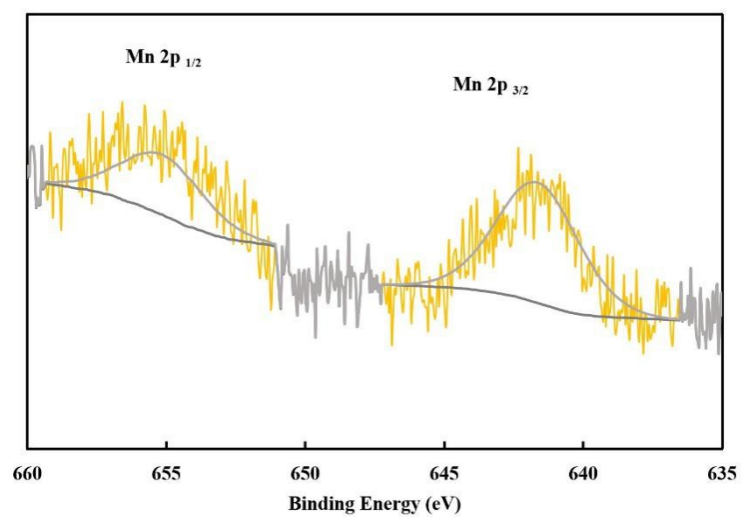


Fig. S8 Mn2p XPS spectra of ZIF-7(Mn).

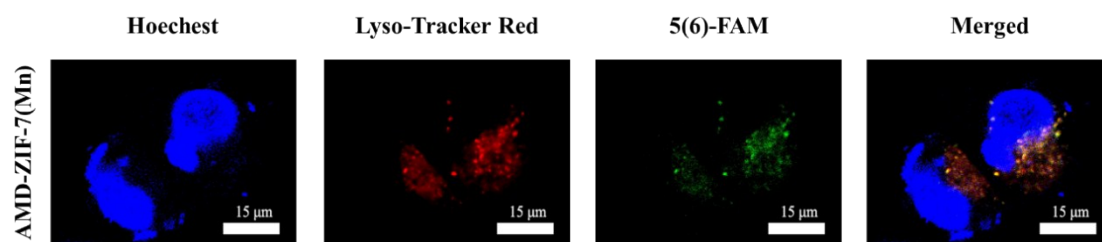


Fig. S9 LSCM images of 5(6)-FAM-loaded AMD-ZIF-7(Mn).

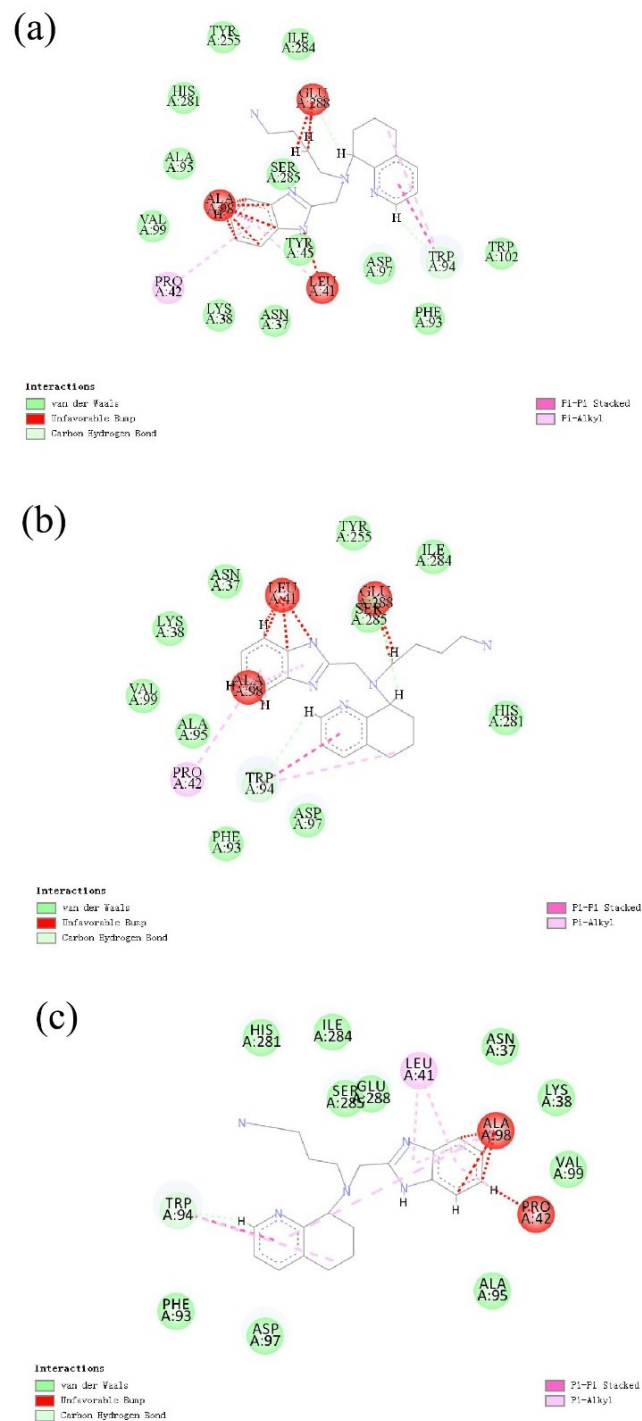


Fig. S10 Analysis results of three scoring functions (**a**: chemplp, **b**: chemscore, **c**: goldscore) employed for the interactions of AMD in amino acid residues from CXCR4 receptors visualized with Discovery Studio Visualizer v.19.1.0.18287.

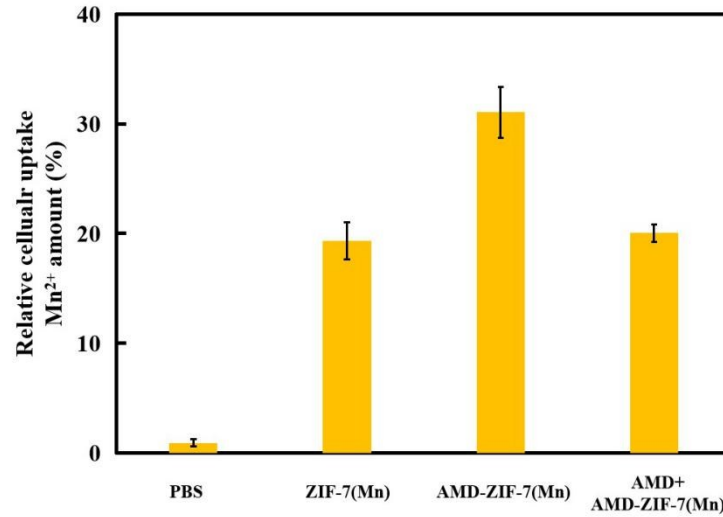


Fig. S11 Investigation of active targeting effect of AMD on ZIF-7(Mn). K-150 cells were respectively incubated with PBS, 10 $\mu\text{g/mL}$ ZIF-7(Mn), 10 $\mu\text{g/mL}$ AMD-ZIF-7(Mn), and 10 $\mu\text{g/mL}$ AMD-ZIF-7(Mn) with 26 nM free AMD was added 1 h before to block the CXCR4 for 24 h. Mean $\pm$ SD (n = 3).

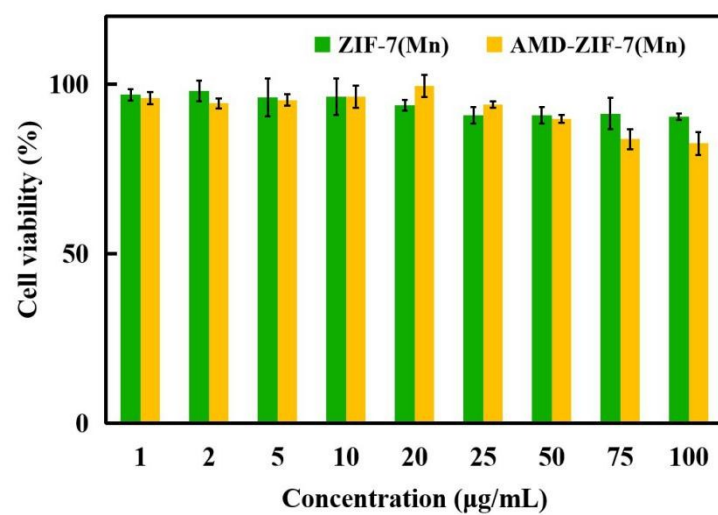


Fig. S12 Cell viability of ZIF-7(Mn) and AMD-ZIF-7(Mn) incubated with MCF-10A cells for 24 h. Mean $\pm$ SD (n = 3).

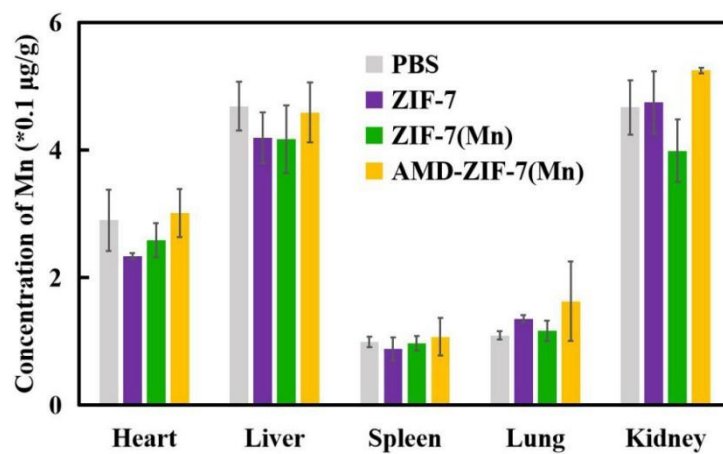


Fig. S13 Metabolism studies *in vivo* of 14 days after injection of 50 mg/kg PBS, ZIF-7, ZIF-7(Mn), and AMD-ZIF-7(Mn), by determining the amount of Mn^{2+} . Mean $\pm$ SD (n = 3).

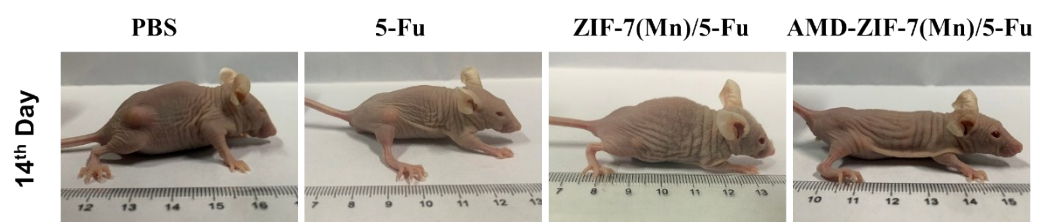


Fig. S14 Photography of tumor-bearing mice 14 days post-injection.

Table S1. Mn²⁺ exchange ratio of ZIF-7(Mn) at different condition.

Sample No.	Reaction Time (h)	Reaction Temperate (°C)	Molar Ratio of Mn ²⁺ to ZIF-7	Exchange Ratio of Mn ²⁺ (%)
1	12	60	3:1	3.84 ± 0.25
2	24	60		7.41 ± 0.40
3	36	60		10.02 ± 0.24
4	48	60		9.27 ± 0.26
5	24	55		5.70 ± 0.34
6	36	55		7.64 ± 0.22
7	48	55		7.39 ± 0.21
8	24	50		4.22 ± 0.21
9	36	50		5.11 ± 0.18
10	48	50		6.51 ± 0.30