In-situ Crystal Growth of Zeolitic Imidazolate Frameworks (ZIF) on Polyurethane Nanofibers Based Electrospinning

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Supplementary Information

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Figure S1 SEM of PU nanofiber before (a) or after (b) pretreatment

FigureS2 SEM pictures of ZIF-8 in-situ synthesis on PU without pretreatment (a), (b) and with pretreatment (c),(d).

Figure S3 Size distribution of ZIF-8 nanoparticles

FigureS4 Crystal structure of ZIF-8 nanocrystal：(a) Zn C N (b) simplified graphic of (a)

FigureS5 FTIR of ZIF-8

FigureS6 TEM and EDS of ZIF-8

FigureS7 TGA of ZIF-8

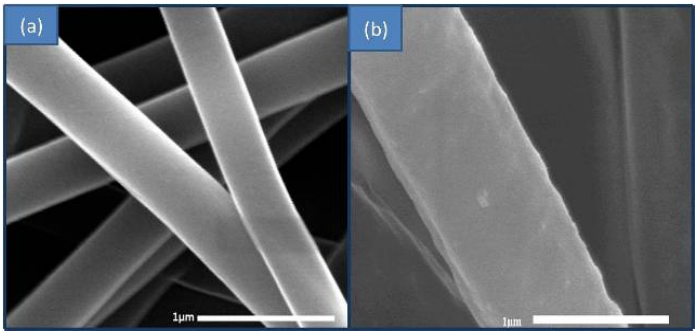
Characterization

The crystalline nature of the samples were determined by Powder X-ray diffraction patterns collected on Rigaku D/max-2000 diffractometer with Cu Kα irradiation (λ = 0.1540 nm)at 40KV and 40mA. The specimens were scanned at a rate of 6°/min within the 2θ range of 5-50°. FEI Quanta 200F scanning electron microscope (SEM) operating at 20kv was applied to examine the morphology of samples. Powder specimen for transmission electron microscope (TEM) was dispersed by absolute ethanol and added a drop of the dispersion on a copper-supported carbon film. Observations in bright-field contrast were made by FEI F20 microscopy at an acceleration voltage of 200 kV. Thermal gravimetric analyses (TGA) was performed on NETZSCH STA 409 apparatus in a temperature range of 20 to 1000°C at a heating rate of 10°C/min under flowing air gas (35 ml/min). The infrared spectroscopy of sample was conducted using a Nicolet 6700 FT-IR spectrometer from 400 to 4000 cm^{-1}.

SEM pictures of electrospun polyurethane nanofibers were shown in figure S1.Before pretreatment, the

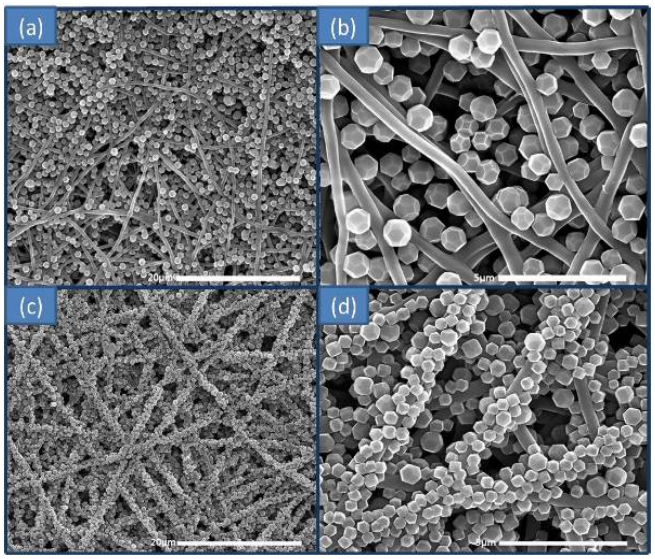
surface of nanofibers was smooth. After the pretreatment, the surface of PU fibers became uneven and the contact area of ZIF-8 with PU nanofibers increased which provided more binding sites for zinc ions. In figure S2, the cohesion of ZIF-8 nanoparticles with un-pretreatment PU fibers was poor. Although in-situ synthesis for four times, the loading of ZIF-8 on PU fibers was lower. However, after the acid pretreatment, the ZIF-8 nanocrystals were attaching the PU nanofibers closely.

Surface pretreatment method: 5g concentrated sulfuric acid (98 wt %) and 10g chromic anhydride were dissolved in 100ml deionized water and stirred continuously in order to form uniform solution. The obtained PU nanofibers were then immersed into the solution for 30s. After washing with deionized water, the PU nanofibers were washed with potassium carbonate solution (10 wt %). Last, the sample was washed with deionized water again.



Solution: Conc.H_2SO_4 5g, CrO_3 10 g, Deionized water 100 ml.

Figure S1 SEM of PU nanofiber before (a) or after (b) pretreatment



FigureS2 SEM pictures of ZIF-8 in-situ synthesis on PU without pretreatment (a), (b) and with pretreatment (c),(d).

ZIF-8 was characterized with SEM, TEM, FTIR, XRD and TGA.As shown in figure S3, ZIF-8 nanoparticles

(ZIF-8 NPs) were well-shaped polyhedron and the diameters were nearly 326 to 476 nm. According to the structure data from CCDC（number:602542）, the crystal structure of ZIF-8 was drawn by Mercury 3.1 and shown in figure S4.XRD pattern was corresponding well with simulated result (in Fig.1). The structure of ZIF-8 was also verified by FTIR which was in agreement with other reports[1, 2, 3](figure S5). TEM picture and EDS indicated the nanoparticle contained large amount of Zn. As shown in figureS7, the thermal stability of ZIF-8 was high to 400℃.

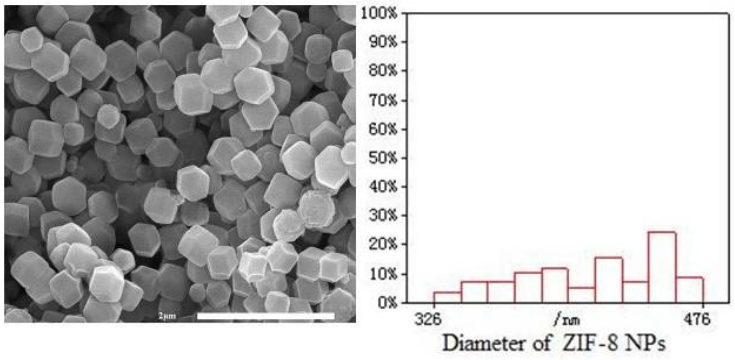
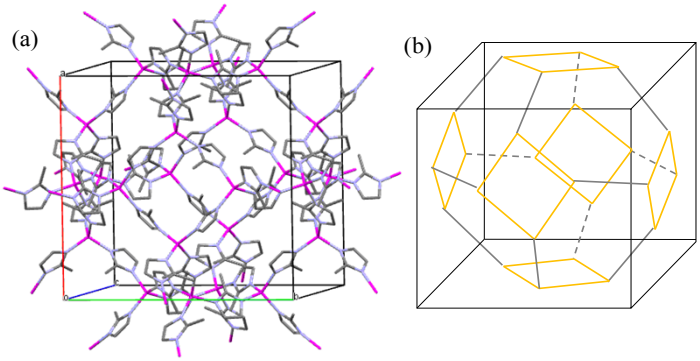
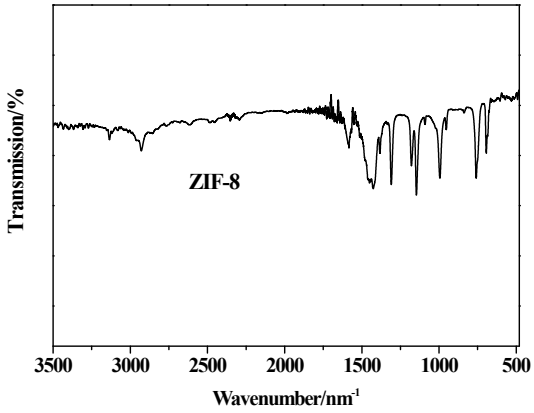


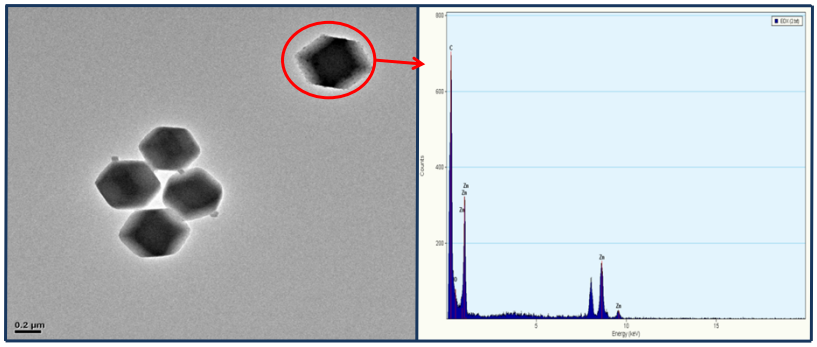
Figure S3 Size distribution of ZIF-8 nanoparticles



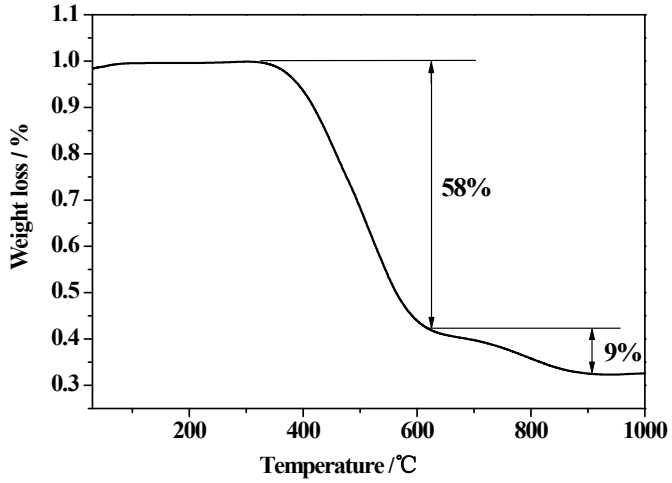
FigureS4 Crystal structure of ZIF-8 nanocrystal：(a) Zn C N (b) simplified graphic of (a)



FigureS5 FTIR of ZIF-8



FigureS6 TEM and EDS of ZIF-8



FigureS7 TGA of ZIF-8

References

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