Electronic Supplementary Information (ESI)

Three-dimensional hierarchically structured PAN@γ-AlOOH fiber films based on fiber templated hydrothermal route and their recyclable strong Cr(VI)-removal performance

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1. Characterization

The phase of the products was analyzed by X-ray diffraction (XRD), in a 2θ range from 10º to 80º, using Cu Kα radiation (Philips X'pert diffractometer). The morphology and microstructure was examined on a field emission scanning electron microscope (FESEM, Sirion 200 FEG) and transmission electron microscope (TEM, JEOL-2010, 200 kV) with an energy-dispersive X-ray spectrometer (EDS, Oxford, Link ISIS). For TEM examination, the products (or fibers) were first dispersed in ethanol, and then dropped directly on the holey carbon grid.

2. Cr(VI) adsorption measurements

The isothermal adsorption experiments could be chiefly described below. $K_2Cr_2O_7$ was used as the source of Cr(VI). The Cr(VI) aqueous solutions with different concentrations were prepared and the pH value was adjusted by HCl or NaOH. For each sample, 0.1g composite fiber-films were added to the above solution (60 ml)**.** The mixture was first stirred by glass rod and then kept for 24 h to establish adsorption equilibrium at room temperature. Finally,

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the fiber mat was then fished out of the solution. For comparison, 30mg γ-AlOOH nanopowdes were thrown into 60 ml of $K_2Cr_2O_7$ solutions with different concentrations of Cr(VI) ions at a pH of 3 for 24 h and separated by centrifugation after adsorption equilibrium. The Cr(VI) concentration in the remaining solution was measured by an inductively coupled plasma atomic emission spectrophotometer (ICP-AES Atomscan Advantage) to determine the Cr(VI) ion removed by the adsorbent. The adsorption isotherms were obtained by varying the initial Cr(VI) concentrations and at different pH values.

3. Recycling experiments

To study the regeneration and reusability of the PAN@γ-AlOOH fibes as an adsorbent for Cr(VI) removal, the experiments were carried out in 4 consecutive adsorption/ desorption cycles. Firstly, 0.1g composite fibers were thrown into 50 ml solution with Cr(VI) concentration 30 mg/L and at pH=3, for 24h, to reach adsorption equilibrium. Subsequently, it was fished out by tweezers and washed to neutrality by deioned water to remove the free Cr(VI) ions. After drying for 5h at room temperature, the washed composite fibers were then desorbed by soaking in the 40 mL extraction medium (0.01 M NaOH solution) for 24h. Then the fibers were taken out, washed and dried again for re-use.

Fig. S1 Yongxing Lin et al

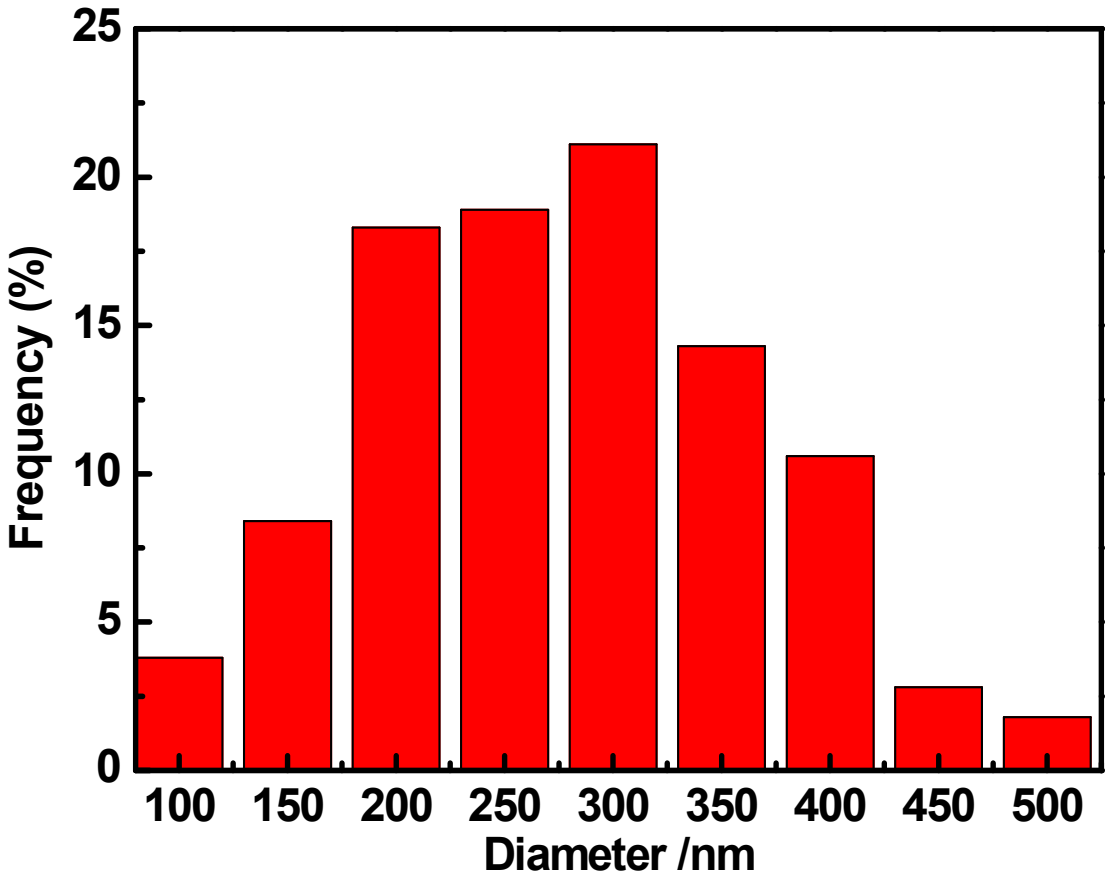

Fig. S1. The histogram of the electrospun PAN fibers' diameter

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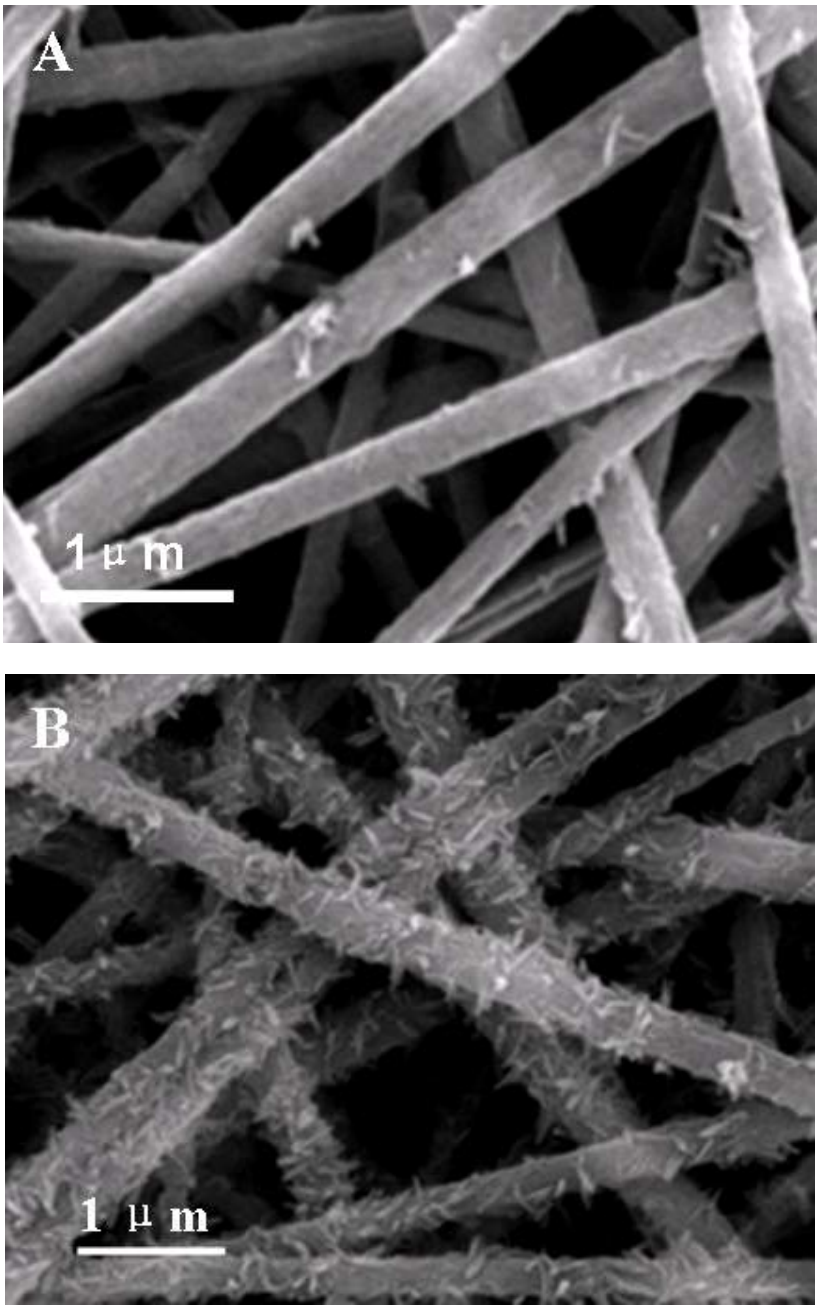

Fig. S2. FESEM images of the composite fibers obtained at 110 ºC for different reaction time: (A) 3 h, (B) 6 h.

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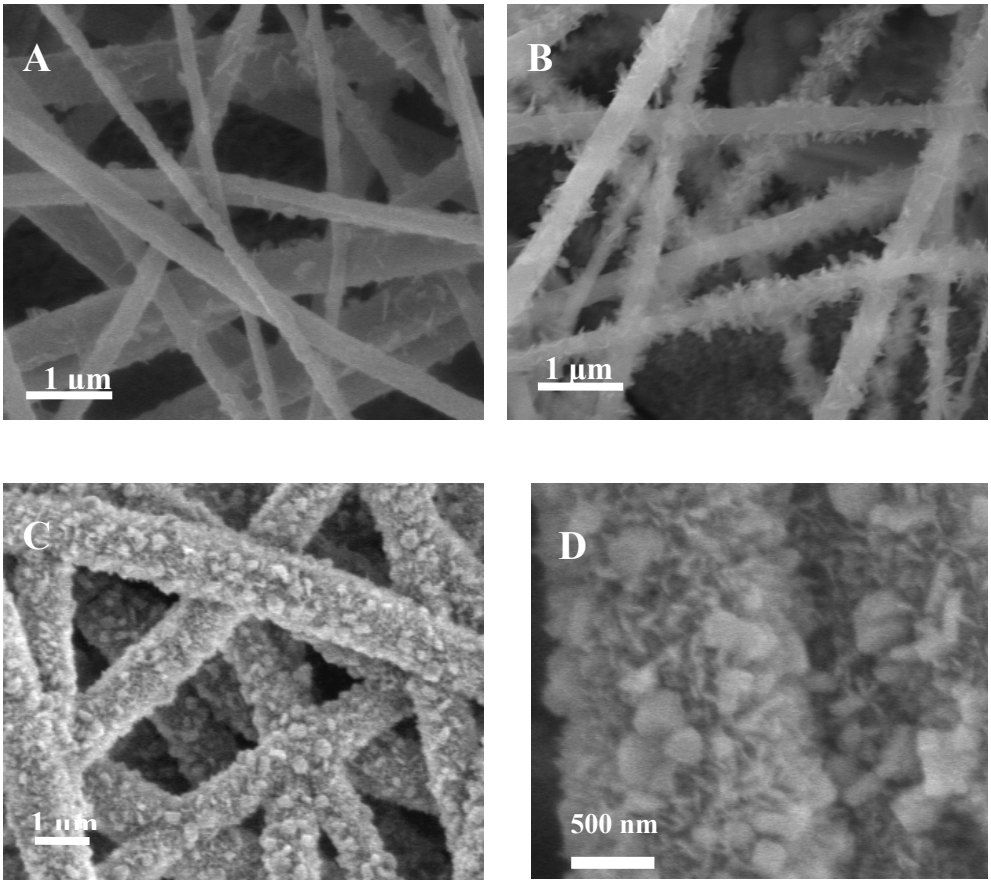

Fig. S3. FESEM images of the composite fibers obtained by addition of different amounts of $C_6H_{12}N_4$ in the reaction system. Reaction time was for 10 h. (A) 0.1%, (B) 0.25% and (C) 10% in weight. (D) a local magnification of (C).

Fig. S4 Yongxing Lin et al

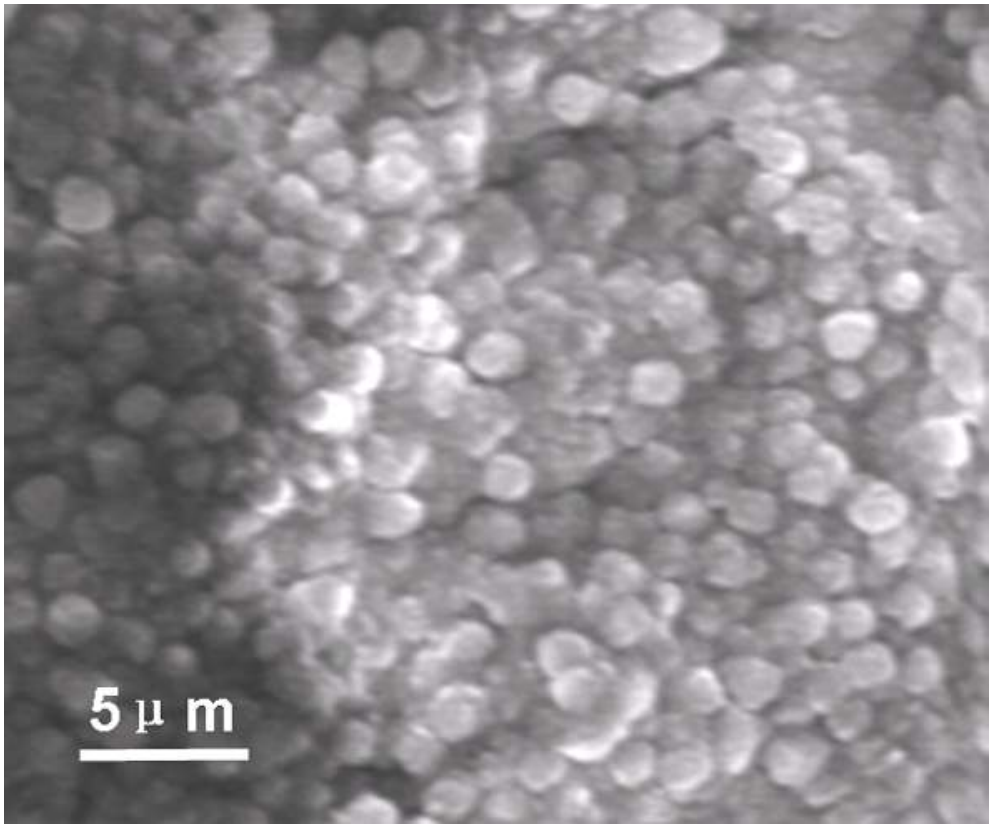

Fig. S4. FESEM image of the morphology of γ-AlOOH nanopowers synthesized according to Ref.[33.]

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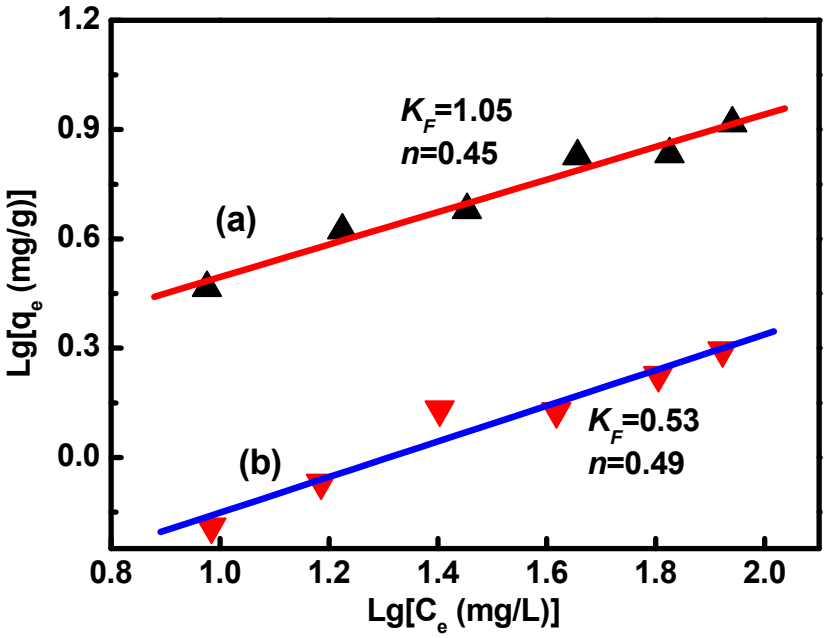

Fig. S5. The polts of lgq_e vs lgC_e for adsorption of Cr(VI) ions on the composite fibers (a) and γ-AlOOH nanopowders (b). The parameter $\mathbf{q_e}$ is the equilibrium adsorption amount, and $\mathbf{C_e}$ is the equilibrium concetration of Cr(VI) in the solution. Data from curves (a) and (a_0) in Fig.3A. Solid lines are the fitting plots according to Freundlich model or the equation (Ref.[34]):

$$q_e = K_F \times C_e^{1/n} \qquad \text{(S1)}$$

where K_F ($mg^{1-1/n}L^{1/n}g^{-1}$) and n are the parameters reflecting the adsorption capacity and the adsorption intensity, respectively.