Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Supplementary Information

Low filtration resistance three-dimensional composite membrane fabricated via free surface electrospinning for effective $PM_{2.5}$ capture

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Table S1. Properties of low concentrations PAN solutions

Samples	PAN (wt%)	Viscosity (Pa·s)	Surface tension (mN m^{-1})	Conductivity (μS cm^{-1})	Average microsphere diameter (nm)	Average fiber diameter (nm)
PAN-S3	3	56	36.42	52.8	733±98	-
PAN-S4	4	71	36.58	63.7	670±85	-
PAN-S5	5	96	36.59	73.6	658±75	84±13
PAN-S6	6	116	36.70	81.9	568±70	88±15

Table S2. Properties of high concentrations PAN solutions

Samples	PAN (wt%)	Viscosity (Pa·s)	Surface tension (mN m^{-1})	Conductivity (μS cm^{-1})	Average fiber diameter (nm)
PAN-F8	8	197	37.72	100.9	115±22
PAN-F10	10	338	37.74	109.4	139±28
PAN-F12	12	688	37.77	117.7	204±31
PAN-F14	14	1534	37.80	123.5	230±36

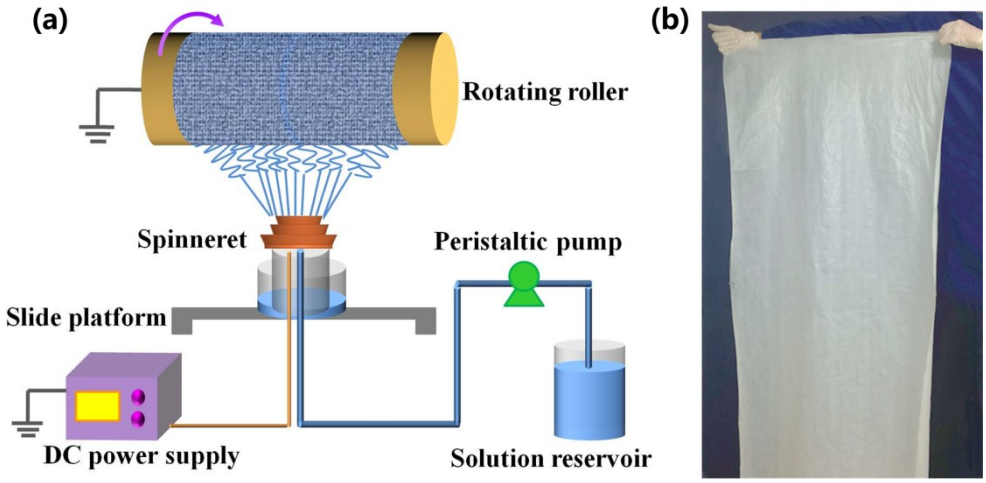

Fig.S1 (a) Free surface electrospinning apparatus with stepped pyramid-shaped spinneret, (b) photograph of nanofibrous membrane with length of 1.6 m and width of 0.6 m endowed with excellent filtration property produced in 10 min.

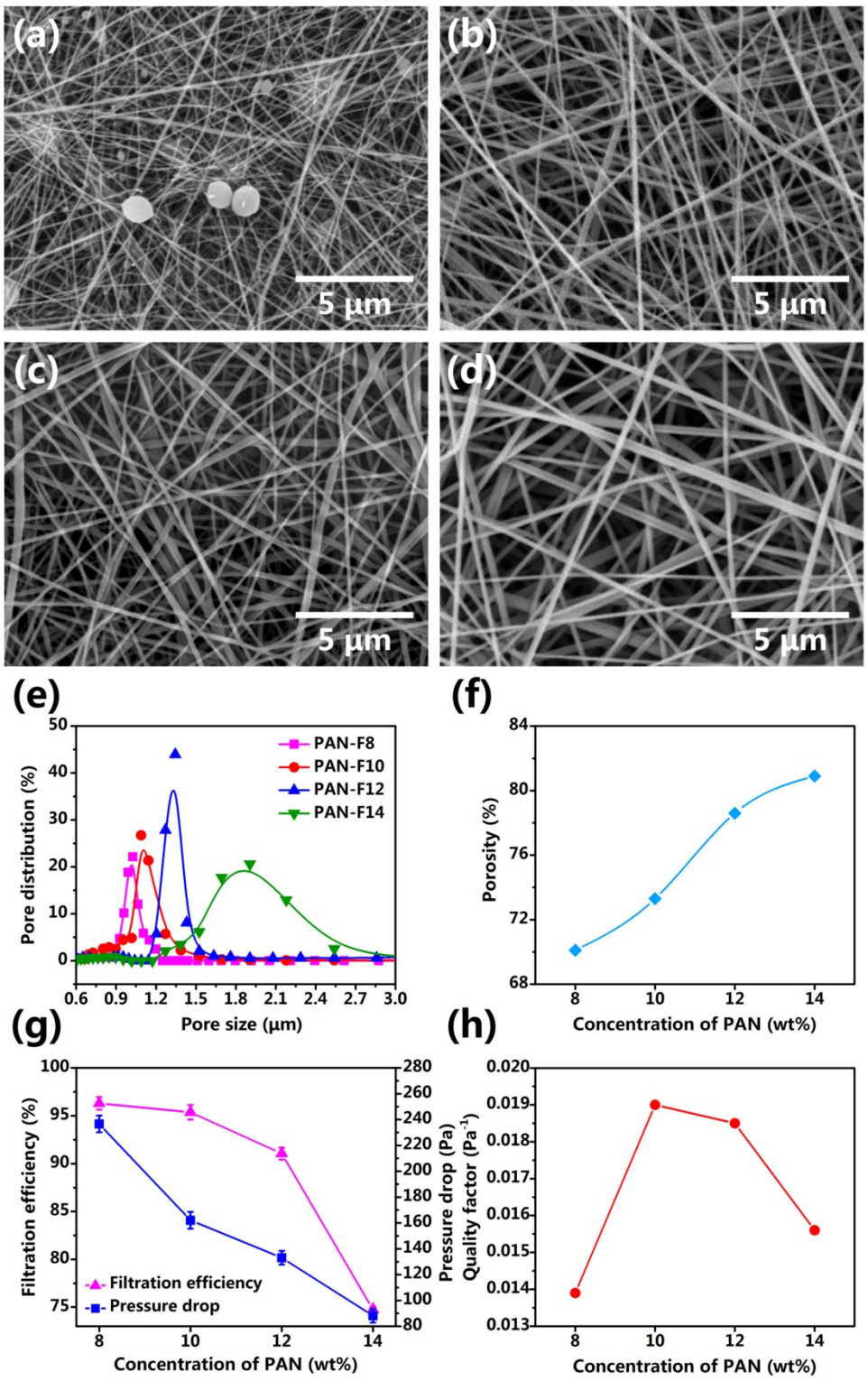

Fig.S2 Morphology, structure and filtration property of PAN nanofibrous membranes, SEM images of (a) PAN-F8, (b) PAN-F10, (c) PAN-F12, (d) PAN-F14, (e) pore size distribution, (f) porosity, (g) filtration efficiency and pressure drop, (h) QF value of PAN membranes (~0.46 g m^{-2}) under airflow velocity of 14.1 cm s^{-1}.

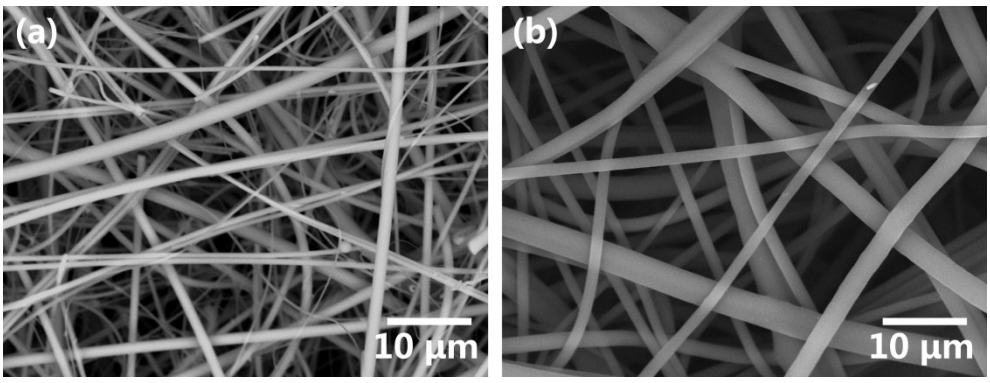

Fig.S3 SEM images of commercial fiber-based air filtration materials, (a) glass fibers. (b) electret melt-brown PP fibers.

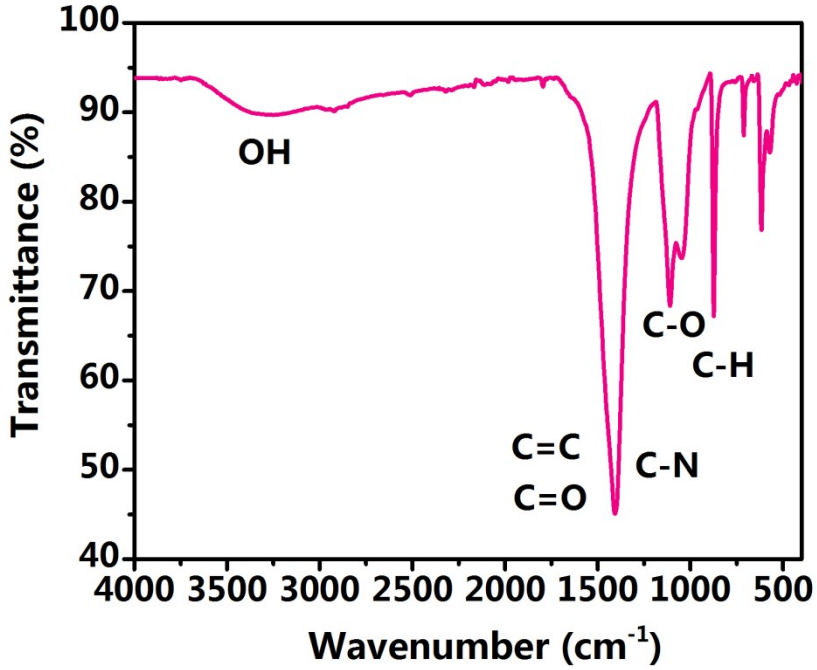

Fig.S4. FTIR spectrum of the ash of burnt cigarette.