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Electronic Supplementary Information (ESI)

Antifouling sandwich-structured electrospun nanofibrous membranes by integrating fluffy and hydrophobic layers for long-term airborne particulate matters segregation

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Fig.S1 The influence of ultrasonic treatment on SiO₂ particle

The diameter and the image of SiO_2 particles showed negligible changes after ultrasonic treatment for 1 h.





Fig.S1 The diameter distribution (a) and the SEM image (b) of SiO₂ particles after ultrasonic treatment.

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Fig.S2 The pore size diameter distribution of membranes



Fig.S2 Pore size diameter distribution of membrane with different amount of SiO₂ doping.

Membrane	Face velocity	Pressure	filtration efficiency	QF
	(cm s ⁻¹)	drop (Pa)	$(\eta, \%)$	(Pa ⁻¹)
PAN	7.1	57	98.8	0.077
PAN-SiO ₂ (2)	7.1	41	94.6	0.0713
$PAN-SiO_2(5)$	7.1	52	96.4	0.0644
PAN-SiO ₂ (8)	7.1	50	96.0	0.0645

Table. S1 PM_{2.5} filtration performance of membrane with different SiO₂ doping amount.

Fig.S3 and Table S2 TGA test for nanofibers

The SiO_2 content in nanofibers with different SiO_2 doping amount were calculated via TGA in Fig.S3 and Table S2. Results showed that the SiO_2 content in nanofibers were very close to the theoretical calculated one.



Fig.S3 TGA analysis plot of membrane with different SiO₂ doping amount.

Mambrana	SiO_2 content in
Memorane	nanofibers (wt%)
$PAN-SiO_2(2)$	1.99
$PAN-SiO_2(5)$	5.31
PAN-SiO ₂ (8)	7.75

Table S2 The SiO₂ content in nanofibers with different SiO₂ doping amount

Fig.S4 The chemical interaction between membrane and PM_{2.5}

The typical spectra of PAN identified as methyl este and cyano groups in the membrane before and after PMs filtration were both presented without position shift, proving no chemical interaction occurred between PAN and PMs.



Fig.S4 FTIR spectra of the PAN-SiO₂(5) ENM before and after $PM_{2.5}$ filtration.



Fig.S5 SEM images of the membranes after PM_{2.5} captured.

Fig.S5 SEM images of membranes after 0.88 mg cm⁻² PMs segregation. (a) PAN/PET ENM, and (b) PAN-SiO₂(5)/PET ENM.