Supplementary Information (SI) for Journal of Materials Chemistry A.

Supporting information

Shape Memory Superamphiphobic Sponge: A Tunable Platform for Oil Aerosol Filtration

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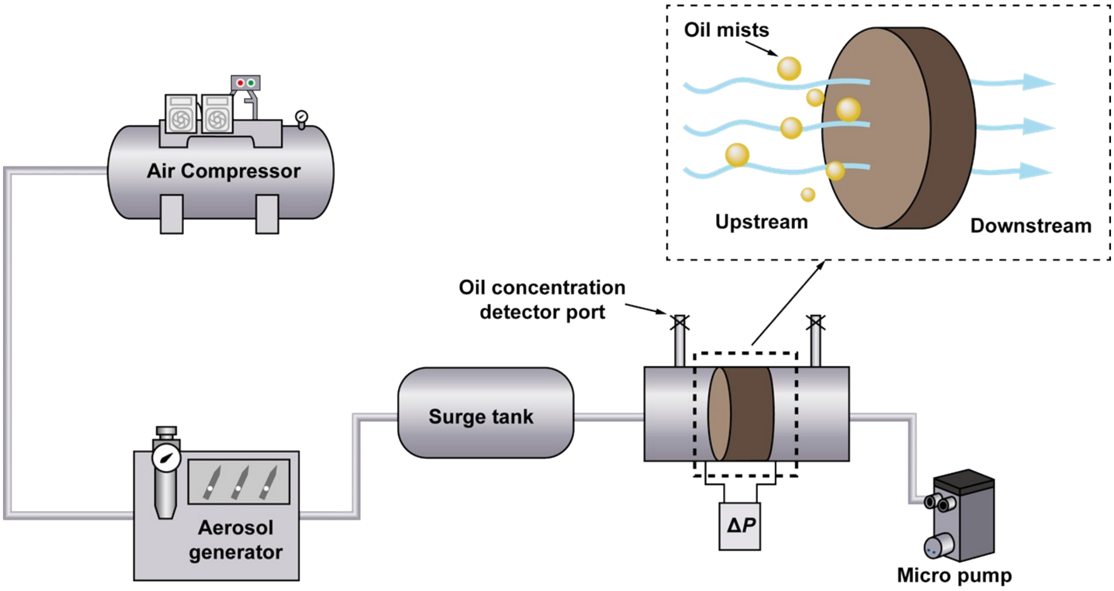

Fig. S1 A schematic diagram of oil aerosol filtration device.

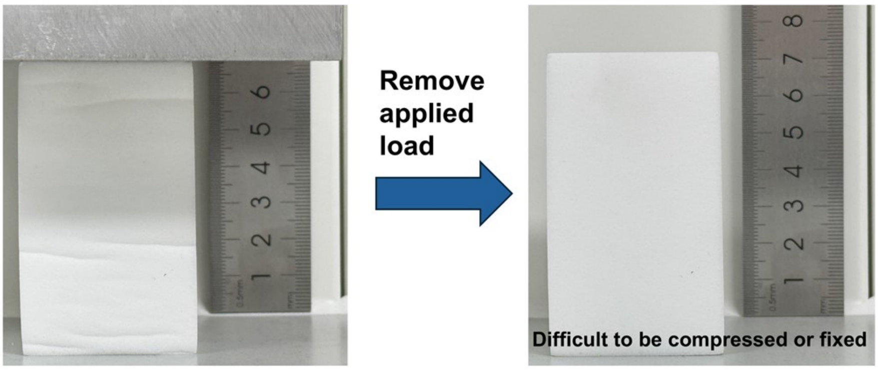

Fig. S2 Compression performance of melamine sponge.

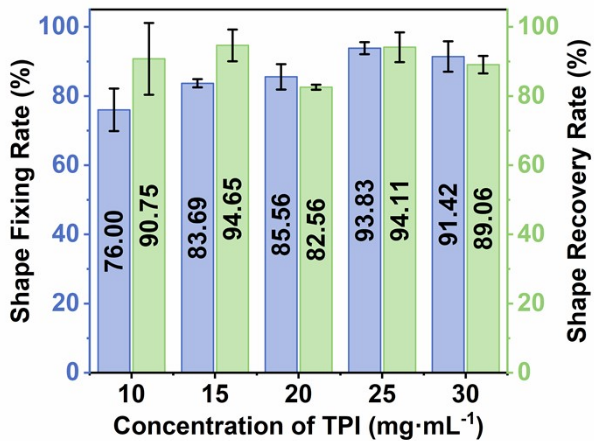

Fig. S3 Effect of TPI concentration on the shape memory performance of SMSAS.

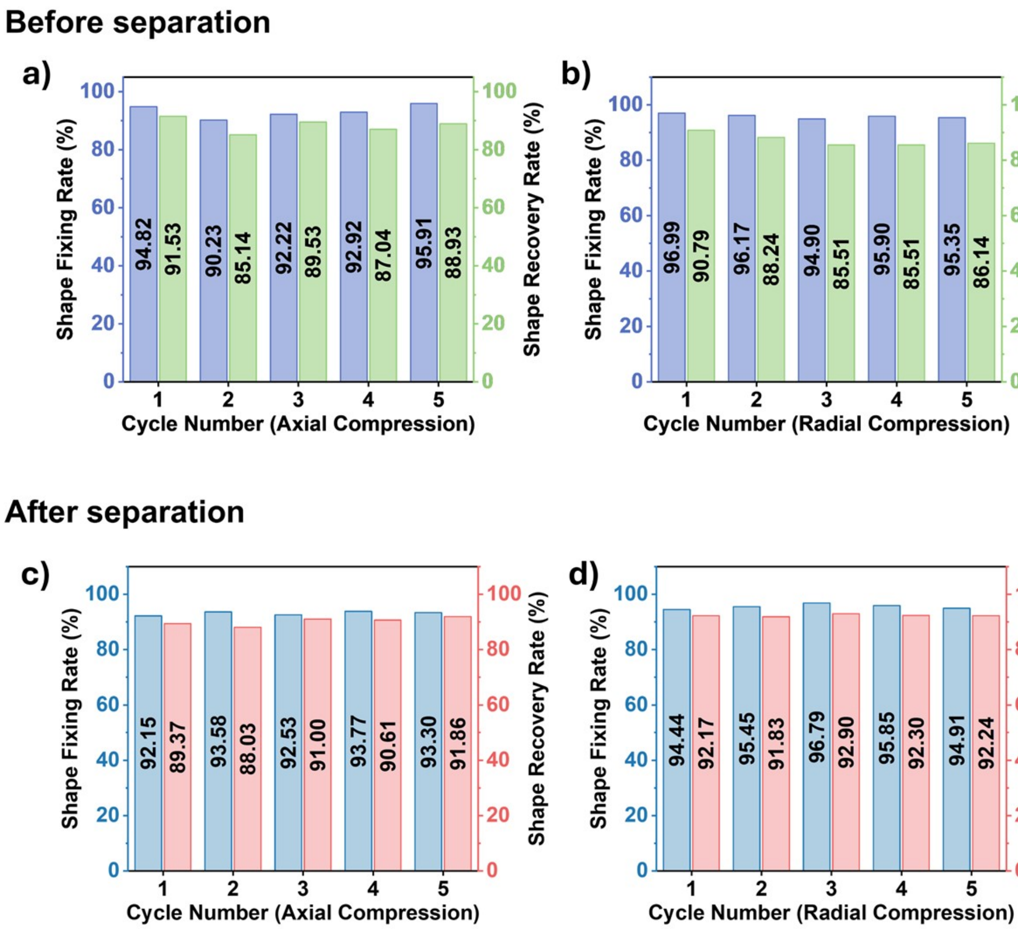

Fig. S4 Shape memory performance of SMSAS before and after separation.

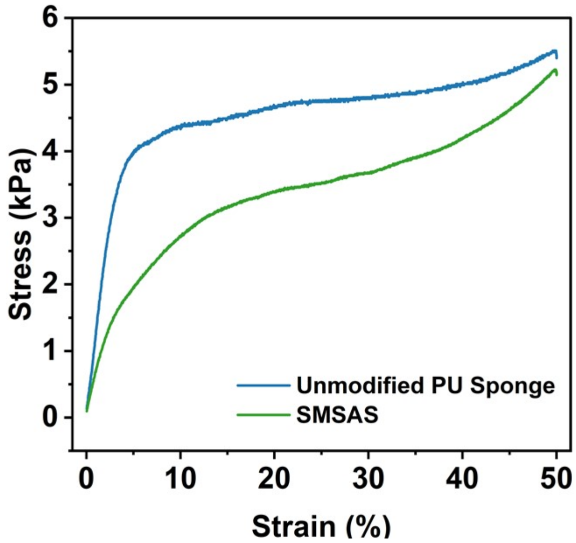

Fig. S5 The Stress-Strain curves of PU sponges before and after surface modification.

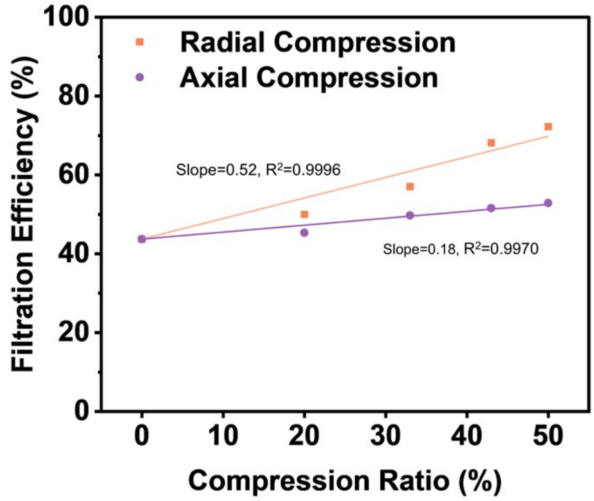

Fig. S6 The linear fit curve of separation efficiency and compression ratio.

Table S1. Comparison of different materials for oil aerosol filtration.

Ref.	Material	Material type (2D/3D)	Filtration duration (h)	Filtration efficiency (%)	Pressure drop (kPa)	Quality factor (kPa^{-1})
1	PFAP@GF	2D	3	99.4	8.33	0.61
2	Superoleophobic Coalescing filters	2D	20	99.9	3.5	1.97
3	Janus nonwoven filter	2D	-	99.45	9.29	0.56
4	PVDF/PSF blend nanofiber	2D	0.083	99.99	0.123	74.88
5	GPTE/PFAP	2D	3	98.37	4.16	0.99
6	Coalescence	2D	360	>90%	<10	~0.23
7	Dual-scale Janus filter	2D	4	99.4	8	0.64
8	NW-CS-Nylon 6-OP	3D	-	99.4	0.5	10.23
9	MTMS aerogel	3D	0.02	95	0.2	14.98
10	3D knitted spacer fabrics air filter	3D	0.5	90	0.08	38
CECO™ Environmental	Filter	2D	4.67	98.92%	1.62	2.8
Jiangsu Jiulang High-Tech Co., Ltd	Superamphiphobic ePTFE	2D	-	>99%	<1	~4.6
This work	Shape memory superamphiphobic sponge	3D	24	95.4	0.054	57.02

References

1. X. Wei, F. Chen, H. X. Wang, H. Zhou, Z. L. Ji and T. Lin, *J. Mater. Chem. A*, 2018, **6**, 871-877.
2. F. Chen, Z. L. Ji and Q. Q. Qi, *Sep. Purif. Technol.*, 2019, **209**, 881-891.
3. X. Wei, H. Zhou, F. Chen, H. X. Wang, Z. L. Ji and T. Lin, *Adv. Funct. Mater.*, 2019, **29**, 1806302.
4. L. Xu, P. Jiang, L. Peng, C. C. Cai, Y. J. Lu, Z. Y. Zhu, H. X. Wang, X. Wei and T. Lin,

Chem. Eng. J., 2025, **524**, 168925.
5. X. Wei, Y. F. Liu, H. Zhou, F. Chen, H. X. Wang, Z. L. Ji, G. G. Chase and T. Lin, *ACS Appl. Mater. Interfaces*, 2020, **12**, 28852-28860.
6. F. Chen, W. H. Yu, Z. L. Ji, G. Y. Lin, H. P. Ding, L. M. Pi and X. L. Wu, *Chem. Eng. Res. Des.*, 2022, **187**, 306-318.
7. D. Wang, Z. Q. Zhou, T. L. You, B. Liu, Q. Q. Xie, L. Y. Wang, G. L. Xu, Y. Liang and M. Tang, *Sep. Purif. Technol.*, 2025, **366**, 132672.
8. F. J. Xiong, X. Wang, Y. Q. Liu, Z. B. Zhang, T. Zhang, H. C. Gao, H. S. Fu, J. Y. Huang, X. M. Qian, Y. K. Lai and S. N. Zhang, *J. Environ. Chem. Eng.*, 2023, **11**, 110443.
9. B. Nowak, M. Bonora, M. Zuzga, L. Werner, A. Jackiewicz-Zagorska and J. M. Gac, *J. Environ. Chem. Eng.*, 2022, **10**, 108410.
10. Y. Sheng, Q. Ren, L. Zhang and Y. Q. Wang, *Build. Environ.*, 2020, **186**, 107365.