Perfluorinated Nanofiber-Based Wearable Healthcare Devices for Air Filtering and Health Monitoring

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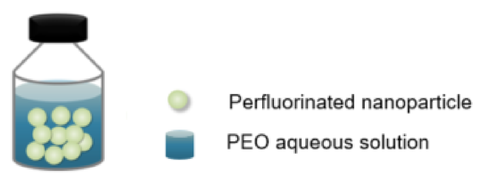
Introduction

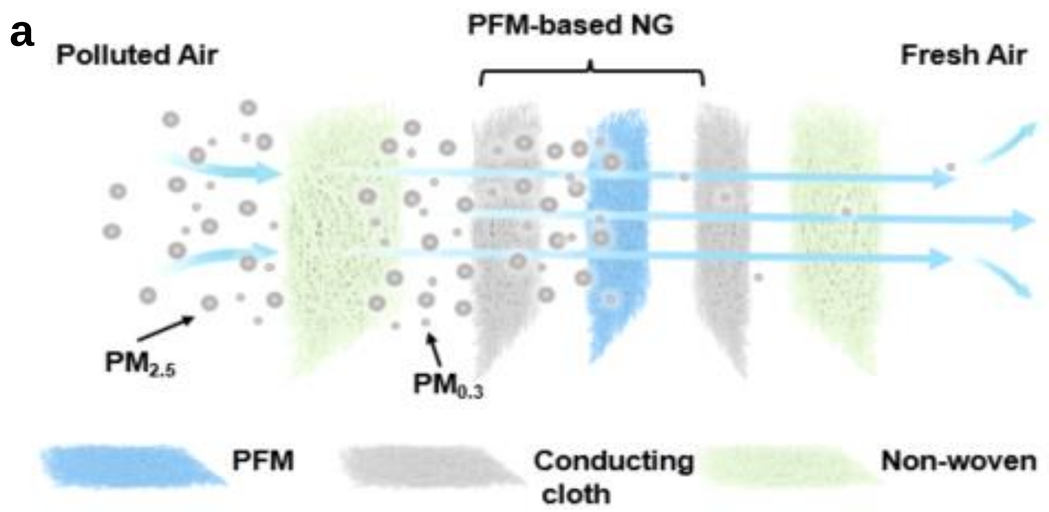
Wearable and breathable healthcare devices for air filtering and health monitoring are urgently needed since particulate matter (PM) caused a serious air pollution threatening to public health. Herein, we present dense monocharged perfluorinated electret nanofibrous membrane (PFM). The charge-rich PFM exhibits a high surface potential to realize efficient ultrafine $PM_{0.3}$ removal with low pressure drop. Furthermore, the PFM-based nanogenerator (NG) is able to detect body motion and physiological signals. The strategy of fabricating PFM provides a novel approach for obtaining charge-rich electret materials and designing healthcare devices to protect people from $PM_{0.3}$ pollution and monitor personal vital signs simultaneously.

Methods



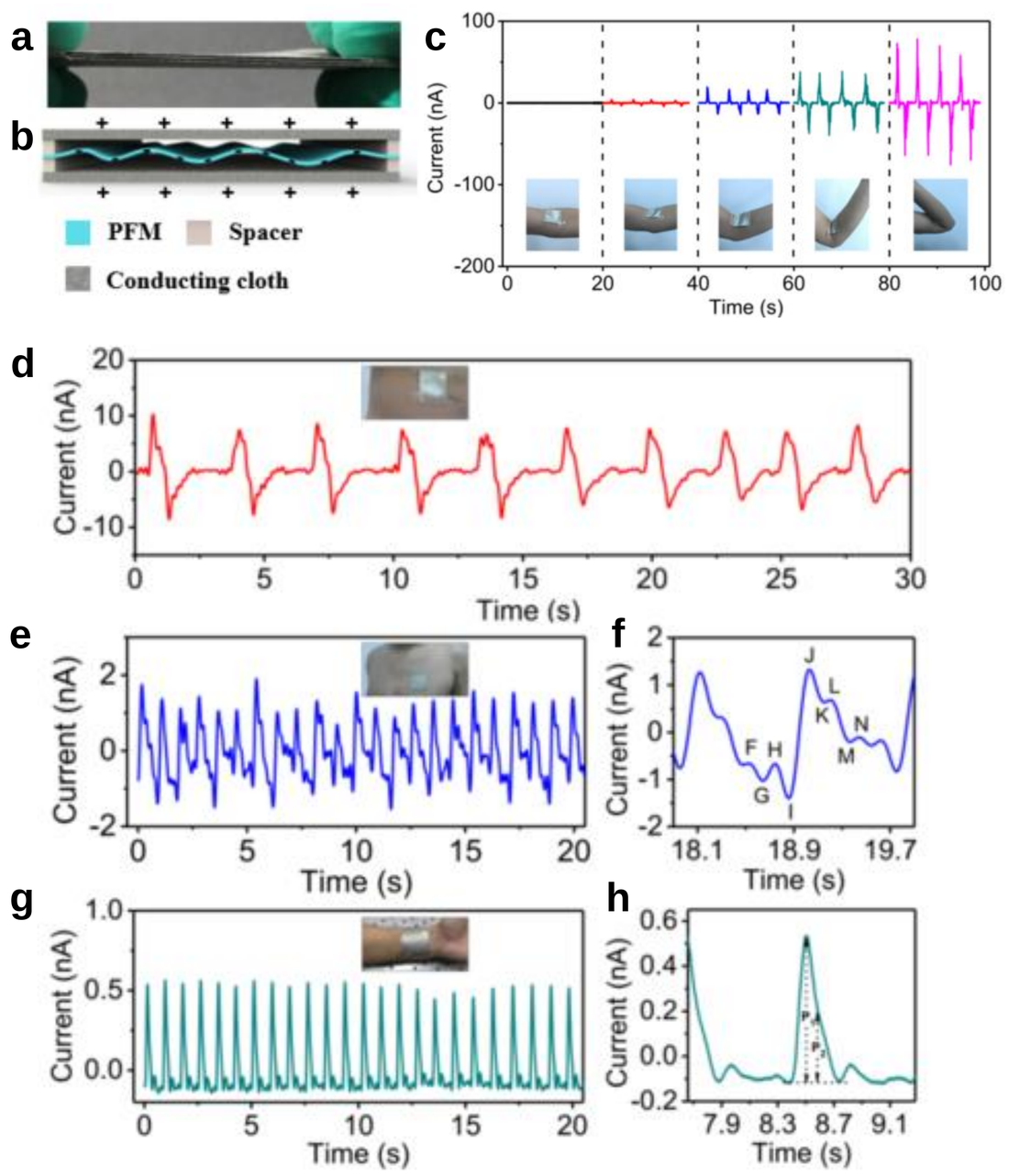
Result

PFM for air filtering



- High removal efficiency for ultrafine $PM_{0.3}$

PFM-based NG for health monitoring



- Body motion and physiological signals detecting

Conclusion

In summary, we have reported a facile method to fabricate charge-rich PFM for air filtering and health monitoring. This PFM owns plenty of real charges, and leading to outstanding $PM_{0.3}$ removal efficiency of 99.712% with a low pressure drop of 38.1 Pa and a high quality factor of 0.154 Pa^{-1}. Additionally, a PFM-based NG assembled by PFM and conducting cloth could act as an excellent self-powered wearable sensor that could quantitatively monitor body motion and biological signals including respiration and heartbeat. This scalable PFM with such high real charge storage capability holds great potential for practical application in air filters for ultrafine PM removing and wearable electronics for body motion and health monitoring.

Acknowledgements

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Reference

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