Scientists Develop Sensitive GSEM-based Bionic Airflow Sensor

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Prof. CHEN Tao's team at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of Sciences (CAS) developed a flexible and self-adaptive airflow sensor enabled by bioinspired thin-membrane, which is mediated by the reversible microspring effect.

Airflow sensors based on mechanical deformation mechanism have drawn increasing attention thanks to their excellent flexibility and sensitivity. However, fabricating highly sensitive and self-adaptive airflow sensors via facile and controllable methods remains a challenge.

Inspired by the bats' wing membrane which shows unique airflow sensing capacity, researchers at NIMTE prepared graphene/single-walled nanotubes (SWNTs)-Ecoflex membrane (GSEM), which can be arbitrarily transferred and subsequently adapt to diverse flat/bend and smooth/rough surface. The study was published in Advanced Functional Materials.

By virtue of the reversible microspring effect, researchers developed a highly sensitive and self-adaptive GSEM-based airflow sensor.

When airflow was applied, the microscale deformation of interlayer SWNTs led to significant variation of contact resistance, endowing the developed GSEM-based airflow sensor with superior properties including the ultralow airflow velocity detection limit (0.0176 m s-1), fast response time (~ 1.04 s) and recovery time (~ 1.28 s).

As a proof of concept, the GSEM-based airflow sensor can be employed to realize noncontact manipulation. Via a threshold control, it was applied to a smart window system to successfully realize the intelligent open and close behaviors.

In addition, researchers designed an array of airflow sensors to differentiate the magnitude

and spatial distribution of the applied airflow stimulus. Being integrated into a wireless vehicle model system, the GSEM-based airflow sensor can sensitively capture the flow velocity information to realize real-time manipulation of motion direction.

This microspring effect-based airflow sensing system shows great potential in the fields of wearable electronics and noncontact intelligent manipulation.

Read the original article on Chinese Academy of Sciences (CAS).