A Micro-Airflow Sensor System Enabled by Triboelectric Nanogenerator for Lab Safety and Human–Computer Interaction

Xucong Wang,

Yingzhe Li,

Chaoran Liu,

Weilong You,

Haiyang Zou,

Chenxi Yue,

Jiagen Cheng,

Weihuang Yang,

Shaoxian Li,

Lazarouk S.[1],

Labunov V.[1],

Gaofeng Wang,

Hongjian Lin,

Linxi Don.

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[1]Belarusian State University of Informatics and Radioelectronics, 6 P. Brovki Street, Minsk 220013 Belarus

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Abstract: The airflow sensor enabled by triboelectric nanogenerator (TENG) is significant for intelligent lab safety and human–computer interaction applications. However, the reported airflow/wind sensor focuses on enhancing the sensing materials and structures, lack of high resolution, and smart signal analysis. Herein, we present a self-powered micro-airflow sensor and its artificial intelligence (AI) system, applied for lab safety and human–computer interaction. The as-fabricated sensor has a high sensitivity of 0.6258 μA /(m/s) and a linearity of 0.9968. Attributing to the Venturi effect, the minimum detection velocity of the sensor is 0.13 m/s. Given the sensor performance, we develop a real-time pipeline gas leak location system with an AI user interface, which achieves a potential low detect error ≤2.9 cm. In addition, we successfully explore other applications, including human exit–entry counting, ventilation alarm, and breath-based smart aid communication. Above all, the airflow sensor exhibits tremendous potential in the AI and Internet of Things.

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