Ultrasensitive flexible magnetoelectric magnetic sensor

Nana Yang, Yaojin Wang*

School of Materials Science and Engineering, Nanjing University of Science and Technology, Nanjing, 210094, Jiangsu, China (email: yjwang@njust.edu.cn)

Abstract

Ever-evolving advances in flexible magnetic sensors are promising to fuel the technological developments in the fields of touchless human-machine interaction elements, navigations modules for next generation consumer electronics, implantable medical diagnosis and bio-inspired magnetic perception for human or artificial intelligence. [1-3]However, the realization of magnetic sensors with simultaneous high-flexibility, ultra-sensitivity, low power consumption and low-cost remains a challenge.

Here, we report a cost-effective, flexible magnetoelelctric (ME) sensor based on ultra-high piezoelectric thick film and Metglas foils. The flexible piezoelectric thick film was fabricated via sol-gel process assisted by two-dimension Mica substrate, which exhibits an ultrahigh piezoelectric coefficient d_{33}>80 pC/N, extending beyond prior art for all-inorganic flexible piezoelectric materials. The ME laminate composite has a strong ME coupling (higher than all flexible ME composite ever reported) due to the exceptionally high piezoelectricity of PZT thick film. The ME sensor is also found to possess a remarkable sensitivity at low frequencies. Moreover, no degradation of the sensor performance was observed after 4000 bending cycles, showing an excellent mechanical and electrical durability. With high sensitivity, excellent flexibility, the ME sensor provides a platform capable of granting us an additional sense of magnetoception and designing various wearable healthcare devices.

References

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