Electrospun Polyaniline Fibers for Gas Sensing
Technology #16757

Applications

This technology is intended to be used in the development of nanoscale chemiresistive sensors to detect gases including ammonia and nitrogen dioxide. These sensors have potential applications in the detection of trace gases for industrial gas leak detection, environmental monitoring, and medical diagnostics.

Problem Addressed

Nanofibers made from electrically conductive polymers such as polyaniline possess a combination of properties such as high specific surface area, mechanical flexibility, and low fabrication cost that make them promising candidates as nanoscale chemiresistive gas sensors. A significant challenge in the development of polyaniline fibers for use as chemiresistive gas sensors is the difficulty of obtaining uniform nanofibers. This invention describes a method of producing uniform polyaniline fibers that addresses this challenge.

Technology

The chemiresistive gas sensors described in this invention are produced from polyaniline through an electrospinning process. The polyaniline is doped with (+)-camphor-10-sulfonic acid (HCSA) to improve its electrical properties. To compensate for polyaniline’s limited ability to form the highly elastic solutions needed for successful electrospinning, it is coaxially electrospun with poly(methyl methacrylate) (PMMA) to produce fibers with a core-shell structure. The PMMA shell is subsequently removed by selective dissolution in isopropyl alcohol, leaving intact doped polyaniline fiber cores.

In terms of measurement sensitivity, the fibers’ resistance change by up to sixty-fold when exposed to ammonia and more than five orders of magnitude when exposed to nitrogen dioxide, allowing detection of these gases at ppm levels. After a brief initial run-in period, the resistance change of the fibers remain reversible, allowing a single sensor to be used repeatedly. The high specific surface area of these fibers also result in short response times on the order of one minute.

Advantages

- Short response times (~1 min)
- High measurement sensitivity
- Reversible changes in resistance allows sensor reuse
- Low detection threshold (ppm levels)

Categories For This Invention:

Life Sciences
Environment
Sensing

**Intellectual Property:**

Electrospun polymer fibers for gas sensing  
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