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A Chemiresistive CO2 Sensor Based on Carbon Nanotube-Functional Polymer Composite Films

CNT-polymer composites deliver reliable, energy-efficient CO_2 sensing for buildings and HVAC systems.

Carbon dioxide levels are commonly used in ventilation control in buildings as a metric for indoor air quality; however, few commercially available sensors exist that can reliably measure carbon dioxide while satisfying the cost and power requirements. Researchers at Purdue University have developed a chemiresistive carbon dioxide sensor based on carbon nanotube-functional polymer composite films to solve the problems of the current more expensive, energy-intensive devices. This carbon dioxide sensor was fabricated using a carbon nanotube thin film in conjunction with a blend of branched polyethylenimine (PEI) and polyethylene glycol (PEG), which served as a carbon dioxide absorbing layer. In order to increase the carbon dioxide uptake further, a poly(ionic) liquid, poly(4-vinylbenzyltrimethylammonium tetrafluoroborate) (PVBMIBF4), was also added to the formulation. Assessments were performed in a bench-top environmental test chamber by introducing a known amount of carbon dioxide balanced with nitrogen. This work demonstrated that fabricated chemiresistive devices, comprised of a PEI-PEG-PIL and CNT combination, successfully sensed changes in carbon dioxide concentration. Given the relatively low cost and their potential for low power consumption, these chemiresistive sensors serve as an attractive alternative to current commercially available carbon dioxide sensors.

Advantages:

-Low-energy

-Low-cost

Potential Applications:

-Carbon dioxide sensors

Technology ID

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Category

Chemicals & Advanced Materials/Polymer Science & Smart Materials

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Materials Science & Nanotechnology/Composites & Hybrid Materials

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