Humidity responsive Polymer/Gold nanoparticles based hybrid Aerogel for real time Monitoring of Human breath

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Abstract:

Humidity sensor has received considerable attention in recent years because of its significance for air monitoring in agriculture, industries, goods stores and medical detections. Herein, we developed a simple, low cost and scalable fabrication strategy to construct a highly sensitive humidity sensor based on gold nanoparticles (AuNPs) and polymer system, by taking the advantage of conductivity and high surface area of gold aerogel. Such aerogel was fabricated by simple freeze drying method and showed conductivity, highly porous and low density structure. The combined gold nanoparticles (AuNPs) and Poly-N-isopropylacrylamide aerogel shown high sensitivity to water molecules due to the presence of amide group in PNIPAm. Interestingly, this report presents that the facile design of gold aerogel humidity sensor can be used to detect human breath under different health states such as sickness, high breath diseases, lungs problem and respiratory system problems, which is promising in practical flexible wearable devices for human health monitoring. In addition, the promising advantage of gold aerogel allow us in whistle tune recognition application.

Porous metal films for optical humidity sensing were prepared from copper nanoparticles protected by a 2-3 nm carbon coating, a silicon tenside, and a polymeric wetting agent. Exposure to water or solvent vapor revealed an exceptional sensitivity with optical shifts in the visible light range of up to 50 nm for a change of 1% in relative humidity. These properties could be attributed to a combination of surface plasmon resonance effects at low humidity and thin film interference at higher water or solvent concentration in the surrounding air. The simple concept and use of ultra-low-cost materials suggests application of such porous metal-film-based optical humidity sensors in large-scale applications for food handling, storage, and transport.

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