Electrospun Metal oxide nanofibers based H2S gas sensor

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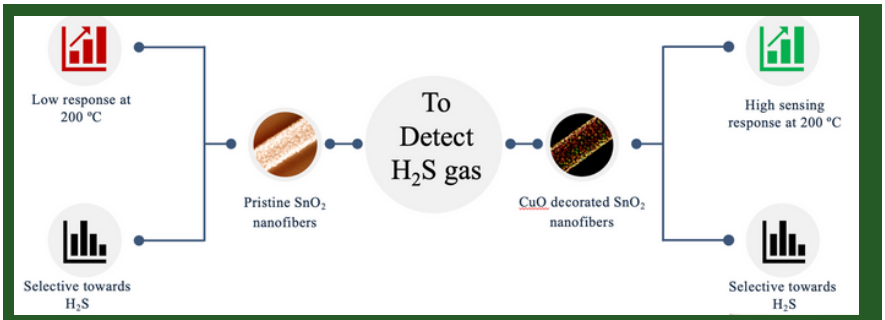

Figure 2: Schematic of work flow to detect H2S gas using Nanofibers

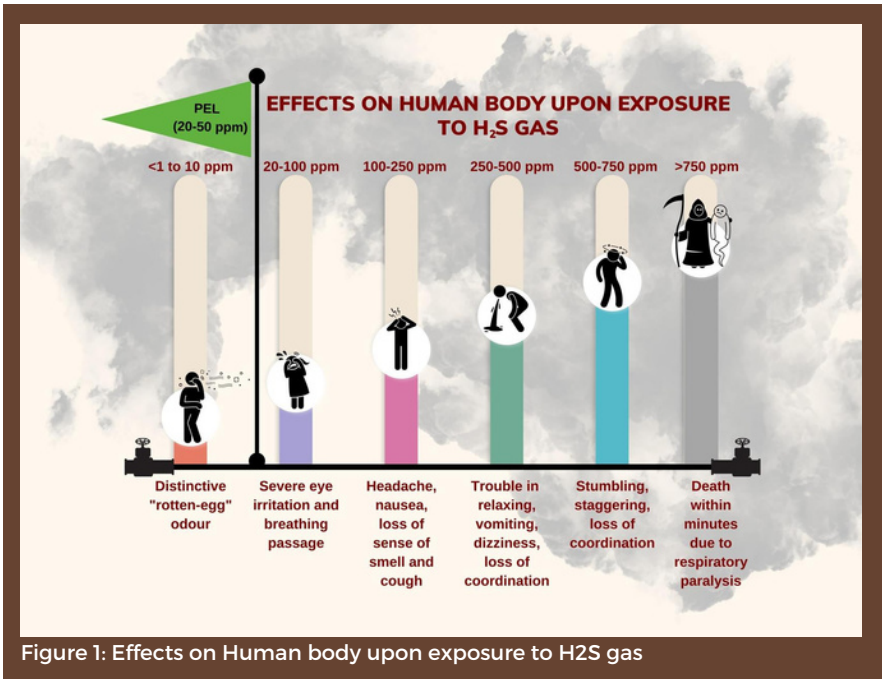

Figure 1: Effects on Human body upon exposure to H2S gas

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Although the permissible exposure limit (PEL) by Occupational Safety and Health Administration (OSHA) for H2S is 20-50 ppm, it can cause severe damage to health and death if exposed to more than the permissible exposure limit. To detect H2S gas, we utilize one-dimensional nanofibers synthesized via electrospinning, as these provide high surface area and ease of surface functionalization. For the detection of H2S gas, we have utilized the electrical properties of metal oxide semiconductors that behave differently as the surrounding atmosphere changes. For better understanding, we selected SnO2 as the primary material due to its high chemical sensitivity, faster gas response, and good thermal stability. A comparative study was done to understand the role of sensing material for H2S gas. Next, the SnO2 sensing was compared with CuO-decorated SnO2 nanofiber. The response for CuO-decorated SnO2 was higher at 200 °C operating temperature than the pristine SnO2 nanofiber. As the sensitivity of each material was high for H2S, our work concludes that SnO2 is a good material for detecting H2S gas. The sensing performance will be enhanced by functionalizing nanofibers with noble metals (Pt, Au, Ag, etc.) for low operating temperatures and using a flexible substrate for an easily portable device.

Reference:

1. Ruksana Shaik, Roopa Kishore Kampara, Amit Kumar, Chandra Shekhar Sharma, Mahesh Kumar, “Metal oxide nanofibers based chemiresistive H2S gas sensors”,Coordination Chemistry Reviews,Vol. 471,2022, 214752, https://doi.org/10.1016/j.ccr.2022.214752

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