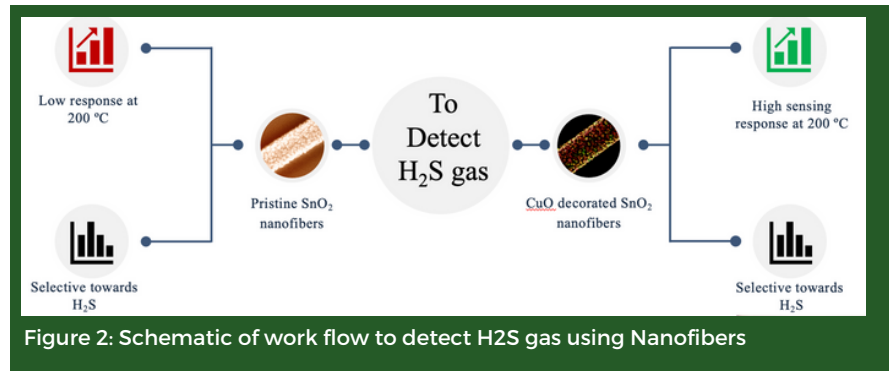


## Electrospun Metal oxide nanofibers based H<sub>2</sub>S gas sensor

KID: 20231305

A tragedy that was a catastrophe and had no parallel in the world's industrial history. Tons of toxic gas leaked and spread throughout the city. Talking about estimated numbers, 10,000 people died, and 5,00,000 suffered. Yes, we are talking about the Bhopal gas tragedy of 1984. In another example, 12 people died, and more than 580 were injured; during a gas leakage at Vishakapatnam in 2020. How many more such gas leakage incidents do we suffer to understand that "prevention is better than cure." CARBON LAB at IIT Hyderabad jointly with Dr Mahesh Kumar (IIT Jodhpur) is working on detecting one of the most poisonous gases, H<sub>2</sub>S, through a flexible metal oxide gas sensor.



Although the permissible exposure limit (PEL) by Occupational Safety and Health Administration (OSHA) for H<sub>2</sub>S is 20-50 ppm,

sensitivity, faster gas response, and good thermal stability. A comparative study was done to understand the role of sensing material for H<sub>2</sub>S gas. Next, the SnO<sub>2</sub> sensing was compared with CuO-decorated SnO<sub>2</sub> nanofiber. The response for CuO-decorated SnO<sub>2</sub> was higher at 200 °C operating temperature than the pristine SnO<sub>2</sub> nanofiber. As the sensitivity of each material was high for H<sub>2</sub>S, our work concludes that SnO<sub>2</sub> is a good material for detecting H<sub>2</sub>S 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 Kampaara, Amit Kumar, Chandra Shekhar Sharma, Mahesh Kumar, "Metal oxide nanofibers based chemiresistive H<sub>2</sub>S gas sensors", Coordination Chemistry Reviews, Vol. 471, 2022, 214752, <https://doi.org/10.1016/j.ccr.2022.214752>

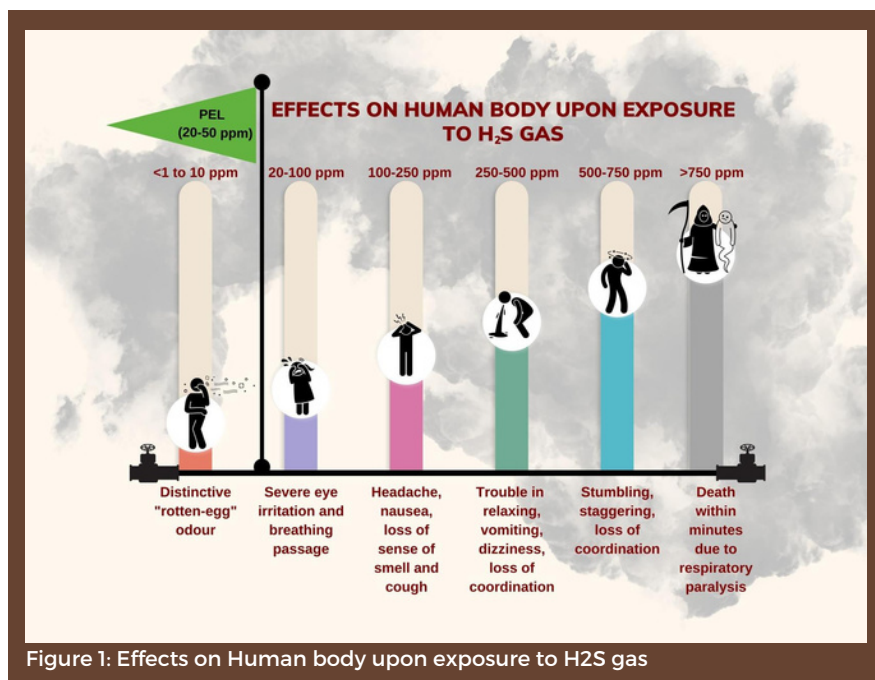


Figure 1: Effects on Human body upon exposure to H<sub>2</sub>S gas

A tragedy that was a catastrophe and had no parallel in the world's industrial history. Tons of toxic gas leaked and spread throughout the city. Talking about estimated numbers, 10,000 people died, and 5,00,000 suffered. Yes, we are talking about the Bhopal gas tragedy of 1984. In another example, 12 people died, and more than 580 were injured; during a gas leakage at Vishakapatnam in 2020. How many more such gas leakage incidents do we suffer to understand that "prevention is better than cure." CARBON LAB at IIT Hyderabad jointly with Dr. Mahesh Kumar (IIT Jodhpur) is working on detecting one of the most poisonous gases, H<sub>2</sub>S, through a flexible metal oxide gas sensor.

it can cause severe damage to health and death if exposed to more than the permissible exposure limit. To detect H<sub>2</sub>S gas, we utilize one-dimensional nanofibers synthesized via electrospinning, as these provide high surface area and ease of surface functionalization. For the detection of H<sub>2</sub>S gas, we have utilized the electrical properties of metal oxide semiconductors that behave differently as the surrounding atmosphere changes. For better understanding, we selected SnO<sub>2</sub> as the primary material due to its high chemical

“  
As the sensitivity of each material was high for H<sub>2</sub>S, our work concludes that SnO<sub>2</sub> is a good material for detecting H<sub>2</sub>S gas.”

- [1] Prof Chandra Shekhar Sharma,  
[2] Shaik Ruksana,  
[3] Kampaara Roopa Kishore  
Creative & Advanced Research Based On Nanomaterials (CARBON) Laboratory, Department of Chemical Engineering,