

IIT researchers develop Hydrogen gas leak detector

Researchers from IIT Hyderabad and IIT Jodhpur have come up with semi conductor materials that can help in the development of reliable hydrogen gas sensors

Detecting hydrogen gas leaks, especially in industrial environments, which can lead to potentially major accidents, has been made simple by researchers of IIT Hyderabad and Jodhpur.

In a joint effort, The researchers have developed materials that can be used as sensors to detect hydrogen gas leak, which are considered hard to detect. Since the gas is highly inflammable, the dangers of a leak too are real.

The IIT researchers have come up with semi conductor materials that can help in the development of reliable hydrogen gas sensors, and lead to quick response capability, both in domestic and industrial environments.

In the long term, the scientists see this development as one step towards a 'hydrogen economy' of the future. The paper has been published in the journal 'Sensors and Actuators' and co-authored by Chandra Shekhar Sharma and Mahesh Kumar and Vijendra Singh Bhati, Akash Nathani and Adarsh Nigam.

On the importance of the work, Chandra Shekhar Sharma of IIT Hyderabad says, importance of hydrogen is growing since its promise as a primary energy source to emerge as a panacea for clean energy generation. However, there are two problems associated with the gas-- one is the difficulty in producing it and second is, its hard to detect. "We have made progress in solving in second", he added.

"What makes hydrogen leaks dangerous is the low ignition energy of the gas and the explosive range (4-75 per cent). Human beings also cannot sense hydrogen because it is colourless and odourless. Therefore tools, especially those with sensors is a must," explained Mahesh Kumar of the IIT Jodhpur.

Type of hydrogen sensors

Many kinds of hydrogen sensors are being studied, including optical, electrochemical and electrical sensors. Electrical sensors, in particular, resistive sensors, are the closest to practicality due to their low cost, simple design and possibility of good sensitivity. The sensors for hydrogen gas must be highly sensitive and selective to the gas.

Technological process

Nano particles of zinc oxide (metal oxide semiconductor) , in which the particle sizes are a hundred thousand times smaller than the width of a single human hair, have good hydrogen sensing properties. The research team has improved the sensitivity of this material even further.

The researchers then loaded the zinc oxide nanoparticles onto nanofibres of carbon and have shown that this results in a sensing response of nearly 74% compared to 44.5% in pure ZnO nanoparticles. Nanofibres are extremely thin fibres that are bundled to look like cotton candy.

The team spun the nanofibres by a process called electrospinning, in which a polymer solution is electrically charged and ejected through a spinneret under a high-voltage electric field. In this work, the researchers used a special polymer blend to obtain nanofibres of the polymer, which was then converted to carbon nanofibres by heating. The zinc oxide was then deposited on the surface of the nanofibres.

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