LOW COST SENSORS FOR THE DETECTION OF GASEOUS HYDROGEN

DESCRIPTION OF THE TECHNOLOGY

Nowadays, hydrogen (H_2) has acquired a noticeable technological relevance. This is due to the fact that the use of H_2 is one of the most promising alternatives to replace fossil fuels in the energy industry.

H_2 is a colourless and odourless gas, with high diffusivity, highly flammable, and explosive at standard atmospheric pressure. Therefore, safety issues concerning its generation, transport, storage and use must always be considered. The development of safety devices oriented towards its detection is mandatory for the implementation of technologies related to this energy vector.

There is a wide variety of H_2 sensors available in the market, but their production costs, size and power consumption of the devices do not meet the demands of a future H_2 economy scenario. In this situation, CNTs can be presented as an alternative towards the development of devices designed for the detection of gases including H_2.

With the objective of overcoming these drawbacks, the Carbon Materials and Environment research group at the University of Alicante has developed a new preparation method of gaseous H_2 sensors by a very simple, efficient, low-cost procedure.

The procedure is based on the utilization of carbon nanotubes and metal nanoparticles as active detection phase. The preparation protocol allows the preparation of sensors with a high signal-to-response ratio, using low metallic loads and with a significantly low cost.

The hydrogen sensors obtained by this procedure (see Figure 1) have been characterized by standard hydrogen detection tests whose results have proven the efficiency in terms of sensitivity, linearity, reproducibility, and response and recovery times (Figure 2).

Likewise, the CNT and nanoparticle suspensions are stable which eases their implementation at different levels, including industrial.

MARKET APPLICATION

The obtained sensors are of special interest for sensors manufacturers and enterprises dealing with devices for the detection of chemical substances. Among other applications, the prepared sensors may be used as safety devices in any industry or application which uses, produces, or stores hydrogen, such as:

- Hydrogen-powered vehicles, hydrogen fuelling stations, hydrogen generation and storage stations, .
- Transportation and storage systems (deposits, low and high pressure cylinders, compressors, pipelines, etc.)
- Industrial vehicle battery charging zones, electrical power station transformers or
- Systems for the analysis and measurement of gases.

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MAIN ADVANTAGES AND INNOVATIVE ASPECTS

- New simple preparation method which does not require sophisticated instrumental techniques.
- The procedure use low-cost materials and optimizes the loading of the metals employed.
- This technology is efficient, producing robust and reliable sensors with high signal-to-response ratio and low cost.
- The CNT and nanoparticle suspensions needed are stable and may be stored over long periods of time.

CURRENT STATE OF DEVELOPMENT

This technology has been developed and tested successfully at laboratory scale.

The results of the different tests have proven the efficiency of these devices in terms of robustness, sensitivity, proportionality between the signal measured and the response of the sensor, reproducibility and short response and recovery times.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by patent:

- *Application number: P201300598*
- *Application date: 20/06/2013*

Also, a PCT application has been filed for international extension

COLLABORATION SOUGHT

Companies interested in acquiring this technology for its commercial exploitation through different technology transfer pathways (licensing, technical cooperation, R&D projects, etc.) are sought.

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RELATED IMAGES

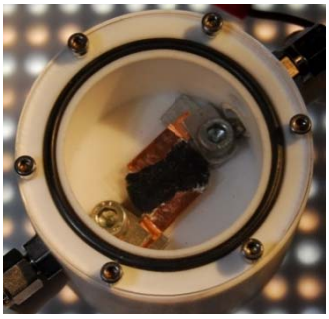

Figure 1. *Device used for hydrogen detection.*

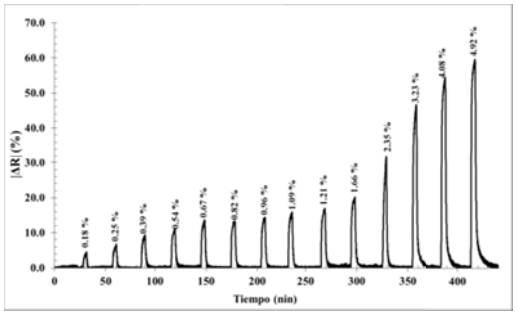

Figure 2*. Results on the sensitivity of the sensor towards different hydrogen concentration, as indicated for each pulse*

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