Measurement technology

Electrical and optical hydrogen gas sensor with Pt/WO_3 thin films

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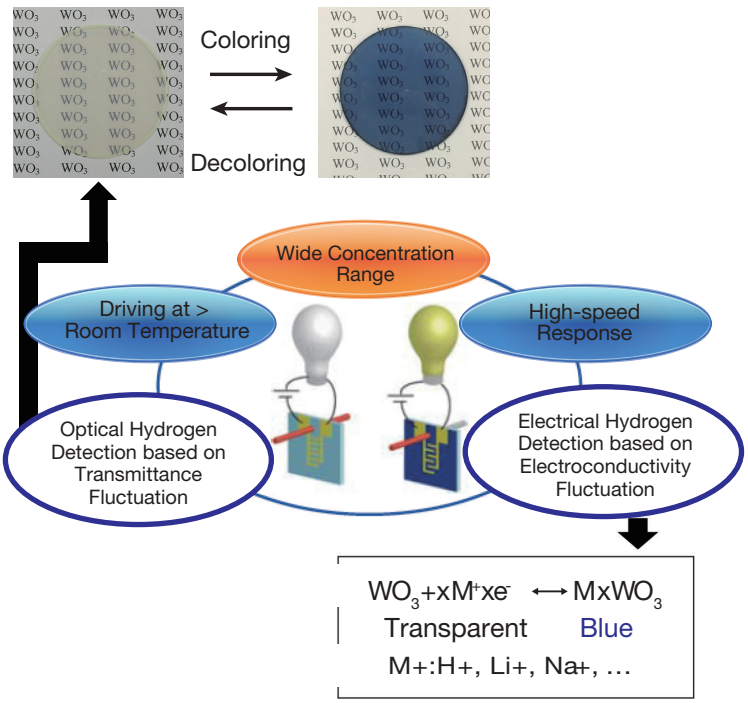
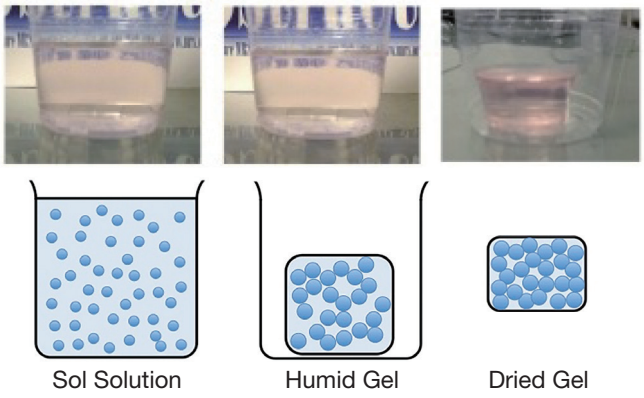
Purpose of Research

Hydrogen energy is one of the most prospective energy sources since it has been employed in various applications, such as a fuel cell, a hydrogen vehicle, etc. However, the hydrogen gas reaches the flammability limit when about 4% to 74% of the hydrogen is contained in the atmosphere, and thus leakage prevention becomes very important. The electrical type or catalytic-combustion type hydrogen sensor has been conventionally used, but it has disadvantages that a detectable concentration range is limited and a detection speed is slow. An object of this study is to implement the hydrogen gas leakage detection with high-speed in the wide concentration range. The study focuses on a material structure, characteristics usable for detection and a device structure.

Summary of Research

A film of oxide (WO_3) is prepared with a sol-gel method, and Pt/WO_3, WO_3 carrying platinum, is further formed on a glass substrate. The researchers have discovered that the hydrogen gas can be detected within the wide concentration range by making the optical/electrical synergy sensor using gas chromism of Pt/WO_3, that is, by combing two physical properties, light and electricity. The high-speed response is realized by controlling microstructure and crystalline of the film prepared with the sol-gel method.





Adjusting Metal Oxide Film by Sol-Gel Method

Only a portion sprayed with hydrogen gas is colored.

Points

- **It can distribute to safe management of hydrogen which attracts attention as the future energy**
- **Good for the ecology and resources**

Future Developments

We have a plan to utilize especially the Pt/WO_3 film formed on the glass substrate as the hydrogen gas sensor in the industry-academia-government cooperation, and to search and develop other materials.

Expected Applications

- Hydrogen gas sensor: measuring and managing under the concerning conditions including fixed quantity from thin concentration close to the flammability limit, which especially requires the high-speed response

Challenges in Implementation

- Collaboration with measuring techniques
- System architecture

What We Expect from Companies

We are finding a partner who is willing to employ and utilize this technology in the various fields.