"Eye-Readable Life Saver," Development of Palladium Tungsten Oxide (Pd-WO3) Nano-Sheet as Gasochromic Hydrogen Sensor

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Hydrogen gas is considered as the best candidate for efficient and clean energy source that can replace petroleum in the future. Hydrogen gas has been found to have a wide range of applications, such as industrial processes, fuel cells, as well as biomedical applications. As fuel, hydrogen can be burned without hazardous residue, only producing water. Despite this advantage, hydrogen has numerous safety issues that must be overcome, as hydrogen becomes explosive in atmosphere when its concentration reaches more than 4%. Since hydrogen gas is colorless, odorless and tasteless, the development of an effective hydrogen sensor is a prerequisite for the application of hydrogen gas as future energy source. This experiment used a simple, inexpensive fabrication process of Pd-WO3 hydrogen sensor nano-composite designed to control the morphology of tungsten oxide to form 2-dimensional plates to maximize specific surface area and enhance sensitivity to hydrogen gas. In this experiment, palladium chloride and tungsten oxide solutions underwent UV treatment. Through such procedure, palladium was deposited onto the crystal structure of tungsten oxide synthesized by acidifying sodium tungstate (Na2WO4) solution in order to achieve a naked eye-readable gasochromic hydrogen sensing system. The response time and magnitude of color change from light grey to thick blue when exposed to hydrogen were both significantly enhanced in the proposed sensor compared to previous Pd-WO3 hydrogen sensors, which use 3-dimensional WO3 nanoparticles instead of 2-dimensional WO3 nano-sheets. This enhancement was due to favorable morphological attributes of the proposed sensors as observed in Transmission Electron Microscope images.

Awards Won:
Fourth Award of $500