

Hydrogen Gas Sensing Properties in Air on PdO Thin Films

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Abstract : In the past decade, Pd based thin films have been studied for hydrogen gas sensors due to their high possibility for energy industry and environmental applications. In this work, we report a novel method to fabricate highly sensitive hydrogen gas sensors based on PdO thin films. The films were deposited on Si substrates in Ar and O₂ ambient using reactive sputtering system. A semiconductor process has been utilized to fabricate PdO films with t=40nm. We observed the resistance changes of the PdO films with various H₂ concentrations. It was found that the electrical properties of the thin films depend on the composition of oxygen. The sensitivity is defined as $S = (R_0 - R)/R \times 100\%$, where R and R₀ are the resistances in the presence of exposing the hydrogen gas and air, respectively. The sensitivity of the thin films was found to be as high as about 95%. After exposing to hydrogen gas, we discovered that the nano-sized cracks formed on the surface of the PdO thin films. The nano-cracks formed in deoxidized PdO thin films were known by playing a key role to reduce more than 4 times the response time of absorption. Our results illustrate that the deoxidized PdO thin films can be used as hydrogen sensors.

key words : hydrogen gas sensors, PdO thin films, reactive sputtering