Thermal Properties of Palladium-Carbon Thin Films for Hydrogen Sensors

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Keywords

nanostructural films, palladium, carbon, hydrogen detector

Abstract

Resistivity of nanostructural C-Pd films for hydrogen sensors were studied in different experimental conditions, such as atmosphere composition and temperature. Temperature-resistivity measurements were done in air and nitrogen atmosphere for temperature from 20 to 200 °C. Resistivity study versus temperature was investigated in a specially prepared setup.

Introduction

Recently many efforts have been conducted to find efficient hydrogen storage materials for mobile or gas detecting applications [1-3]. Both carbon and palladium are taken into consideration as materials suitable for such applications. Palladium is one of the metals that strongly reacts with hydrogen forming palladium hydride PdH_x [4]. Resistance of PdH_x differs from resistance of pure palladium thus it can be applied for detection hydrogen presence in the surroundings. On the other hand there are known various carbon structures that can adsorb hydrogen, like single and multiwalled carbon nanotubes, graphite nanofibers, activated carbons and so on [5, 6]. In this case electrical properties of carbon nanomaterials also change as a result of the adsorbed hydrogen.

In this paper we present nanostructural carbonaceous-palladium (C-Pd) films that can be used as active layers for hydrogen or hydrogen compounds sensor applications. Resistance of nanostructural carbonaceous-palladium film is dependent on hydrogen concentration in the surrounding atmosphere. C-Pd nanomaterials were prepared using two steps method (PVD/CVD) described in details earlier [7]. The previous studies showed that C-Pd samples were sensitive to the hydrocarbons atmosphere and their resistance changes were observed in