Study of Ohmic Contacts to Carbon Layers Containing Palladium Nanograins

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Keywords

contacts, hydrogen sensor, carbon thin films, palladium nanograins

Abstract

Structural, chemical purity and electrical investigations have been performed on chosen Ti-, Mo- and Ni-based ohmic contacts to carbon layers containing palladium nanograins. The active layers were applied as a detection material for sensor of hydrogen compounds. The sensors can be applied for reduction of unwanted emission and the use of fuel and energy.

The active layer resistivity modulation with changing concentration of hydrogen species is the simplest way of hydrogen compounds detection. The response of Pd-based devices to hydrogen is one of the highest one among well-known catalytic metals because the catalytic properties are weakly interfered by OH- group formation. The formation of palladium hydride under such conditions leads to increased number of conductive pathways and results in an overall net decrease in resistance. The resistance changes can be monitored by cheap electronic circuitry what creates cost-effective solution for environmental measurements.

This paper reports on the contacts properties for various parameters of deposition process. The metallization thickness was measured by profilometer and the contact electrical properties were evaluated by the current-voltage (I-V) curves. Then, the selected samples were annealed at temperature of 700°C in nitrogen or argon atmosphere and the influence of the annealing temperature on resistivity was discussed. The microstructure of the metal films was examined by SEM and AFM analysis. SIMS surface analysis has been performed to determine the chemical purity. The dependence of the evaporation power on nickel thickness is presented in fig. 1. The purity analysis of titanium deposited layer is shown in fig. 2.

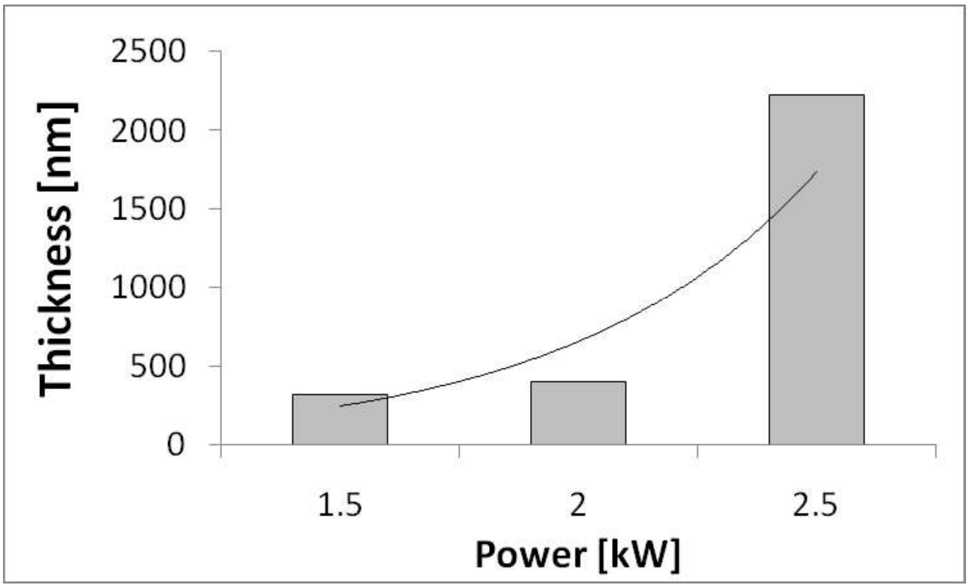

Fig. 1. The influences of deposition power on thickness of nickel layers.

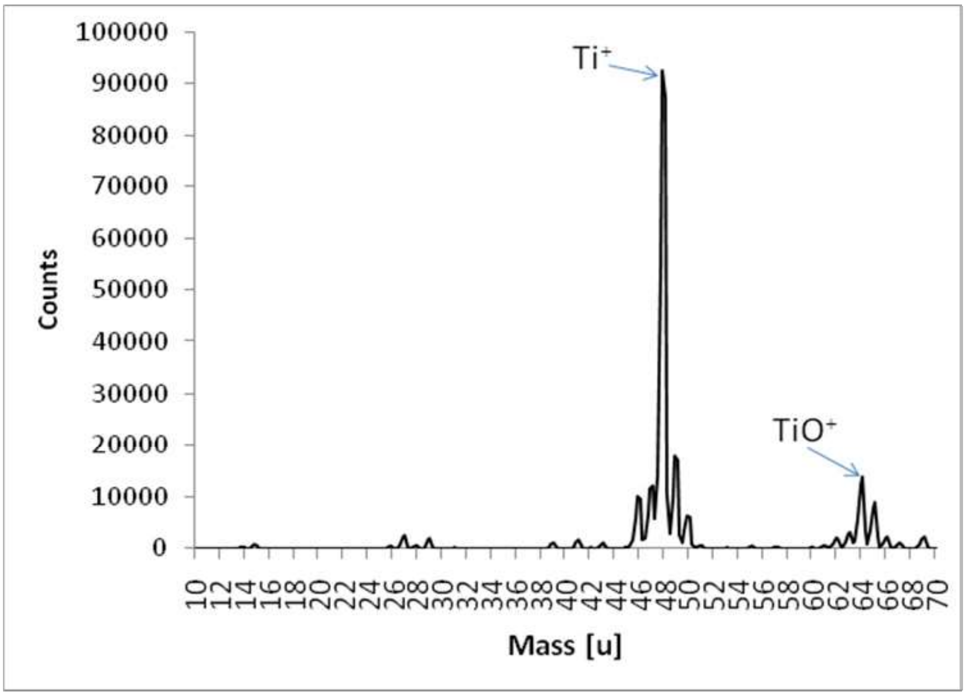

Fig. 2. Mass spectrum of typically obtained titanium layer