Carbonaceous - palladium films for hydrogen sensor applications

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ABSTRACT

Recently, the development in hydrogen techniques detection has been observed due to more and more common applications of this gas. Hydrogen can be used in medicine, transport vehicles, microbiology, chemical industries, waste destruction and food products. Monitoring of H_2 presence in environment is very important for our safety, because this gas together with air forms explosive mixture of above 4% vol. There are various types of hydrogen sensors based on different mechanisms to detect gas, for example using acoustic, optical, resistance or field effect phenomena. In many of these sensors palladium is used as an active layer, because together with hydrogen it forms a new compound - PdH_x the resistance of which is greater than metal's resistance. These changes of resistance can be applied as detection signal to H_2 measure.

In this work we present a simple PVD/CVD method for C-Pd films deposition to use them as active layers in hydrogen or hydrogen compounds sensing applications. Palladium acetate, fullerene C_{60} and xylene are precursors of these films. Technological parameters of both PVD and CVD processes were changed to obtain nanoporous carbon materials containing palladium nanograins. This kind of nanostructural materials with high specific surface area should be sensitive to hydrogen presence. We deposited C-Pd nanomaterials on various substrates among others on ceramics, quartz, silicon, porous silicon, AAO membranes. Synthesized films were studied by SEM, TEM and ASA techniques. On Fig.1 SEM images of CVD films deposited on different substrates are presented.

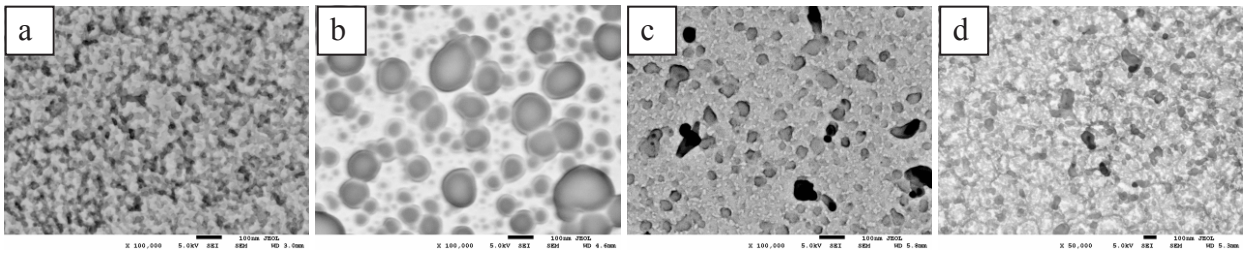

Fig.1 SEM images of CVD films deposited on different substrates: (a) alumina and (b) rutile ceramic; (c) silicon and (d) quartz wafer

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