Influence of Adsorption of Organic Molecules on the PL Spectra of Porous Nanostructure and Carbon Nanotubes, Covering the Surface of Silicon.

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Surface layers can be very sensitive to adsorption of organic molecules, introduced from liquid solution. So, it will be play the role of the detector for different, sometime ecological dangerous, molecules included organic.

Our research has been focused on the preparation and characterization of layered semiconductor structures based on porous silicon (Si_{por}) with embedded nanoclusters of catalytic (Pd, W, Ni), noncatalytic (Cu) and metal-oxide (CuO_x, NiO, WO_x) by means of I(V) characteristics and PL spectra undo organic molecule adsorption and H_2S gas adsorption. The distribution of catalytically active metal on the thickness of porous silicon studied by secondary ion mass spectroscopy (SIMS). The thin metal films were deposited by dc magnetron sputtering from Pd, W, Ni, Cu target in Ar on unheated $Si_{por}/_cSi$ substrate. The morphology of catalytic active composite has been characterized by AFM and SEM.

The adsorption of the donor (glycine, H_2S) and acceptor (methionine) types of molecules was investigated in concentration range of 6,7– 67 μmol/l and 1-100 ppm for . H_2S. Methionine is essential amino acids, belongs to a class of non-polar amino acids with hydrophobic radical. Glycine is a class of polar amino acids with hydrophilic radical. As a result of our experimental studies it was showed that the photoluminescense intensity decreases during methionine adsorption on $Si_{por}/Me(MeO_x)$ composite, while the adsorbed molecules of glycine leads to an increase in intensity photoluminescense, i.e. the signal is changing in two opposite directions.

It was aslo found that the sensor structures with porous silicon filled by palladium, is more sensitive to glycine, while the filling of the pores by copper leads to increased sensitivity to methionine. The structures with W and WO_3 clusters in Si_{por} are more sensitive to adsorption of hydrogen sulfide. Selectivity fo these structures in relation to different types of adsorption of organic compounds makes them promising for producing multi sensor.

A possible mechanism of adsorption sensitivity and selectivity of layered semiconductor structures based on porous silicon filled by different metal clusters to adsorbed amino acids and H_2S gas was proposed.