Nanocomposites and Nanomaterials

Influence of Pt Additives to Nanosized SnO_2 on Sensitivity of Adsorption Semiconductor Sensors to Methane

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In spite of the search for alternative and renewable energy sources, the natural gas is still widely use as a fuel. But the usage of the natural gas is related to some difficulties. First of all, methane as a major component of the natural gas can combine with air explosively. That's why, the leakage of the natural gas can lead to disasters, human, and significant economic losses. Under these conditions, the detection of the natural gas has become a serious problem.

To control the amount of methane in the air adsorption semiconductor sensors based on the nanosized tin dioxide are quite promising. To improve their gas sensitive properties various catalytic dopants are used. Platinum is known to be one of the best catalysts for methane combustion, especially in the air with high humidity. Nanosized tin dioxide has been prepared by a sol-gel technique. To include catalytically active Pt in the base semiconductor material, nanosized SnO_2 has been impregnated by the $H_2[PtCl_6]$ solutions of different concentrations.

As it can be seen from the Fig.1, the sensors based on SnO_2 impregnated by $10{,}6\times10^{-2}$ mol/l $H_2[PtCl_6]$ solution have demonstrated high relative response γ ($\gamma=R_0/R$, where R_0 is the electrical resistance of the sensor in air, and R is the electrical resistance of the sensor in the 937 ppm CH_4) at temperature about 295 - 320 ^{0}C which correspond to the heater power consumption of the sensors 0,3 – 0,35 W. It makes them attractive for commercial use, and perspective for coal mining.

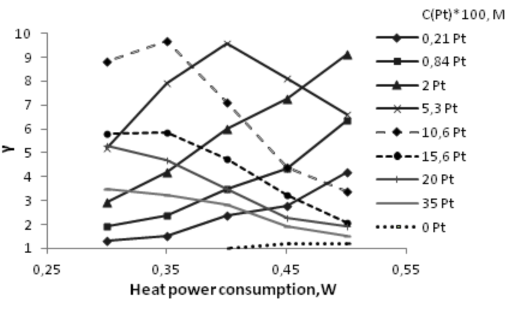

Fig.1. Dependences of relative response to 937 ppm CH_4 on heater power consumption for the sensors based on nanosized

Pt/SnO_2 with different Pt loading.