Physico-Chemical Nanomaterials Science.

Nanopowder Metal Oxide for Luminescent Gas Sensing

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Sensors for active, in particular, toxic and explosive gases play an important role for the monitoring and control of environmental, especially for highly industrialized regions. Gas sensors based on nanosized metal oxides are actually one of the most investigated groups of gas sensors. The present work aims demonstrating of photoluminescence sensing in metal oxide nanopowders. A characteristic feature of the luminescence spectra of the material in the gases is that in addition to the main luminescence bands attached to the luminophor, there are more bands that defined the change of electronic surface states of nanopowders in the gas atmosphere. The features of photoluminescent properties in gases (O_2, N_2, H_2, CO, CO_2) of nanopowdered metal oxides (ZnO, TiO_2, WO_3, SnO_2) obtained them by means of laser ablation [1, 2] have been studied. Found that laser modified [3] and surface doping of materials with impurities of metals (Au, Ag, Pt, Pd, Ni, Cu, Sn) can increase sensitivity to the corresponding gas component and purposefully implement catalytic processes on the surface of nanopowder. Established physicochemical regularities of formation of adsorption surface electronic states initial and doped nanopowders and core-shell structures [2] on their basis during adsorption to gases. The nature of nanopowdered metaloxide gas-sensing properties (adsorption capacity, performance, sensitivity, selectivity) has been established and the design and optimal materials for the construction of the multi-component sensing matrix have been selected.

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