Gas Sensing Properties of Metal Oxide Nanopowders

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Environmental monitoring and registration of active gases are important priorities in world politics, especially for highly industrialized regions where great danger toxic and explosive gases. This is the need for improved means of measuring the chemical composition of atmospheric environments and creating new, more efficient and affordable instrumentation. 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 phosphor, there are more bands that defined the change of electronic surface states of nanopowders in the gas atmosphere. The ZnO surface has a high adsorption and reactivity ability, due to its intrinsic defect structure. However, a wide range of adsorption centers leads to low selectivity material, causing the need to find ways to improve it. Difficulty of selective detection is the result of a similar mechanism of interaction of reducing gases with ZnO surface. Sensitivity of metal oxides unto the nature and concentration of adsorbed molecules largely depends on the surface microstructure, which can be modified, as by laser annealing or formation of complex heterogeneous systems, in particular, metal-semiconductor type of "core-shell". It is established that the value of the sensory signal increases to saturation with increasing of the nanogranules size, it is determined by growth adsorption ability of nanopowders in conditions of manifestation Debye length. Constructed the principle scheme of semiconductor chemical sensor, which is based on effect of transformation of adsorption level in the luminescent signal, the nature of which corresponds to the number and kind of gas particles adsorbed from the environment. Gas registration carried out by analyzing changes in the spectral characteristics of luminescence of matrix (3x3 or more) of modified nanopowders (ZnO, TiO_2 etc.) and core-shell structures on their basis, is located in the gas under the UV excitation and catalytic decomposition of the analyzed gas (fig.1.). Registration luminescence carried out by means of CCD camera with the following digital analysis of the obtained signal, it allows determining the qualitative and quantitative composition of the gas component in the environment.

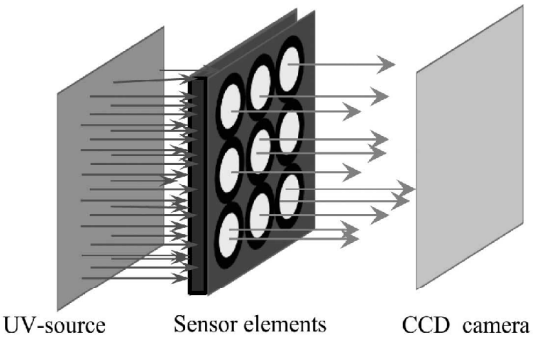

Fig.1. Schematic diagram of luminescence gas sensor