Novel selectivity algorithm for metaloxide chemical sensor on volatile and hazardous gases in the air

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New algorithm is presented for selective identification such gases and vapors in the air as hydrogen, methane, propane, ethanol, acetone etc by use of ZnO and SnO2 based sensors doped with PdO and La2O3. The conductivity responses Δσ(μS) vs. z=1000/T (K-1) from temperature modulation process are interpolated by following parameterized l discriminating functions

which parameters are estimated via nonlinear regression method. The dependences of the principal ones Ai(CY) on analyte Y concentration CY compose multivariate calibration portrait fitting to which an unknown analyte X is identified as the Y (e.g. ethanol in dry air, Figure 1). And the common abscissa of all intersection points of the level lines AiX and calibration curves Ai(CY) defines the analyte concentration in the units used (mg/m3, Figure 1).

In case the abscissas are different or some of them are missing the analyte X is not Y. The method allows selective detection of broad list of analytes in synthesized dry and real wet air and even distinguishes the substances of the same homological group: methane/propane/hexane and ethanol/methanol/isopropyl alcohol. Actually, the method is breakthrough in solving the very important problem among 3S-problems: selectivity, stability, sensitivity.

Keywords: Chemical sensor, Semiconductor, Metaloxide, Rare earth, Selectivity, Nonlinear estimation, Multivariate calibration.

Biography

Viktor Vladimirovich Chistyakov was Born 1957, town of Buy, Kostroma region. He was graduated from the faculty of general and applied physics of Moscow Physical-Technical Institute in 1981. He Defended the dissertation “On chemisorption influence on electro-physical properties of polycrystalline semiconductor adsorbents” in 1992. He worked as a scientist and professor in higher education institutes of Yaroslavl and Saint-Petersburg such as Yaroslavl Pedagigical University named after K. Ushinsky, ITMO University<Mikhailov Artillery Academy. Now he is a senior scientist of the Lab of RareEarth Semiconductors of the Ioffe Institute in SPb.

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