

2.1. CAPABILITIES OF MULTICHANNEL NANO-SENSOR SYSTEMS DESIGNED FOR EXPLOSIVES, NARCOTICS AND DANGEROUS SUBSTANCES MICROQUANTITIES DETECTION

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The paper discusses the method of problem solving relevant to search of illegally transported substances and compounds by means of the multichannel nano-sensor systems. The paper presents the basic system specification as well as methods of such problem solution and area of equipment application.

With advances in transport infrastructure development the problem had occurred relevant to use of this infrastructure for illegal transportation of explosives, narcotics and chemically dangerous substances. One of the top-priority measures for duly detection of illegal transportation actions is regularly performed inspections of the cargos and passengers. During such inspections the basic goal is to reveal the traces of illegal substances and compounds mentioned in the extensive list (approx. 20 substances). This task becomes rather difficult due to the fact that inspection shall be remote, take minimal time and have high results reliability.

Nano-technologies current development makes it possible to extend the list of materials used for sensors manufacturing and, as a result, to have equipment with high engineering performance. Between such materials can be mentioned composite materials containing particles of metals, metal oxides, polymers. These materials became basis of the new type chemical sensors having high sensitivity, selectivity and quick reversible adsorption response. In the multichannel nano-sensor system the use is made of nanocomposite materials combination and those materials have various chemical content. The composite with polymer matrix are synthesized using various filling compounds. Change of filling compound type, its concentration, film thickness provides required number of sensory parameters, for instance, different gases selectivity and sensitivity. Change of metal concentration in the composite corresponding to the metal quantity very close to the percolation threshold level dramatically modify the film morphology and hence its gases sensitivity.

In fig. 1 presented is the layout of nano-sensor sensitive element.

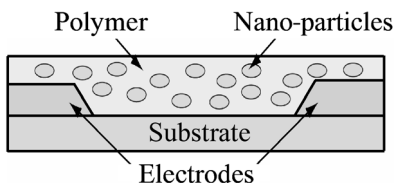


Fig. 1. Layout of nano-sensor sensitive element

The principle of multisensor system operation is based on measurement in the process of sensors interaction with volatile products vapors of the set of various chemical sensors electrical conduction. As a result of examined substance molecular absorption by sensor the electrical conduction of its sensitive elements is increased. It is necessary to remember that each sensor is not strictly selective relevant to this or that gas. Nevertheless the response level of each sensor from the set is individual for each specific gas. The sen-

sors array can consists of from four to several tens of elements. The mathematical processing of data picked up by the sensors array makes it possible to form the unique chemical pattern of the analyzed substance. Obtained results are compared with the list of chemical samples patterns that is stored in the system's built-in memory. The probability of detection of illegally transported substances and compounds approx is. equal to 97%.

The area of such class equipment application is as follows: custom-house checkpoints at the airports terminals, sea ports, railway stations, etc.