Physico-Chemical nanomaterials science

Effect of topology on semiconductor gas sensors' performance

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To create a highly productive gas sensor device several requirements should be accomplished. The most important of them are high sensitivity and selectivity to a target gases, and also a low power consuming of device.

For sensitivity and selectivity improvement more attention is focused on sensitive layer's characteristics, namely on material, it's morphology, stability and adsorption properties. For this purpose nanodimensional materials are more preferred [1]. But electrode geometry also significantly effects on gas-sensing characteristics. Especially important factor is gap size, changing of which influences on the resistance, and consequently on the sensitivity. Choice of gap size in this case depends on gas concentration: for detection of high concentration preferred are large-gap electrodes and small-gap electrodes more useful for low concentration of target gases [2].

Material and geometry of heater are taking into account when considering power consuming and temperature uniformity. Physical properties, operating temperature range and adhesion to the substrate are important characteristics for choosing of material. Power consuming of device can be reduced by choosing of material and altering of heater element's thickness. As was shown in research of Sidek N.M. et al. [3] geometry of heater element has an extremely importance for temperature uniformity. Authors concluded that the best uniformity of temperature distribution can achieved for combination of parallel and meander shapes.

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2. *Shaalan N.M., Yamazaki T., Kikuta T.* Effect of micro-electrode geometry on NO_2 gas-sensing characteristics of one-dimensional tin dioxide nanostructure microsensors // Sensors and Actuators B-2011.-**156**.-P. 784-790.
3. *Sidek O., Ishak M.Z., Khalid M.A., Abu Bakar M.Z., Miskam M.A.*. Effect of heater geometry on the high temperature distribution on a MEMS micro-hotplate // 3rd Asia Symposium (ASQED) -2011.- P. 100-105.