Supplementary Materials

In this work the number of clusters per rod and the number of metal atoms in the cluster were estimated -Table 1. Considering that the average cross-sectional size of the nanorods is 80 nm, we can estimate the amount of gold per rod: with a layer thickness of 4.2 nm there are about $5.06*10^{-16}$ grams per nanorod. Estimated calculations of the number of tin and gold nanoclusters showed that on the samples of ZnO/Au composition ~400-600 gold nanoclusters are located on one nanorod, and on the samples of ZnO/Sn composition ~60-100 tin nanoclusters. Taking the latter into account it is possible to estimate the number of gold atoms in one cluster as (0.9 - 1.5)-10^5 units, and the number of tin atoms in a cluster as (2 - 4)-10^5 units. The above estimates show that the formed clusters can be characterized by the bulk properties of the materials of which they are composed.

Table S1. Estimation of the parameters of metal clusters on a ZnO nanorod

Sample	Thickness Au, nm	Layer thickness d, в cm	The volume of the layer on the area S=1mkm², cm³	Weight of layer with area S=1 μm², grams	Mass of one rod, grams	Atomic % Au (EDS)
ZnO/Au(1)	4.2	4.2E-07	4.2E-15	8.1E-14	5.1E-16	1.37
ZnO/Au(2)	2.5	2.5E-07	2.5E-15	4.8E-14	3.0E-16	0.79
ZnO/Sn(1)	17.2	1.7E-06	1.7E-14	1.3E-13	7.9E-16	4.02
ZnO/Sn(2)	10.2	1E-06	1E-14	7.5E-14	4.7E-16	1.99

On fig. 1* shows the surface composition of the ZnO/Sn(2) and ZnO/Au(2) samples annealed at 200 and 300 °C, since the samples annealed at 100 and 200 °C showed the same results. It can be seen that the quantitative ratio of elements changes as a result of annealing. The decrease in the carbon concentration with increasing annealing temperature is due to its desorption.

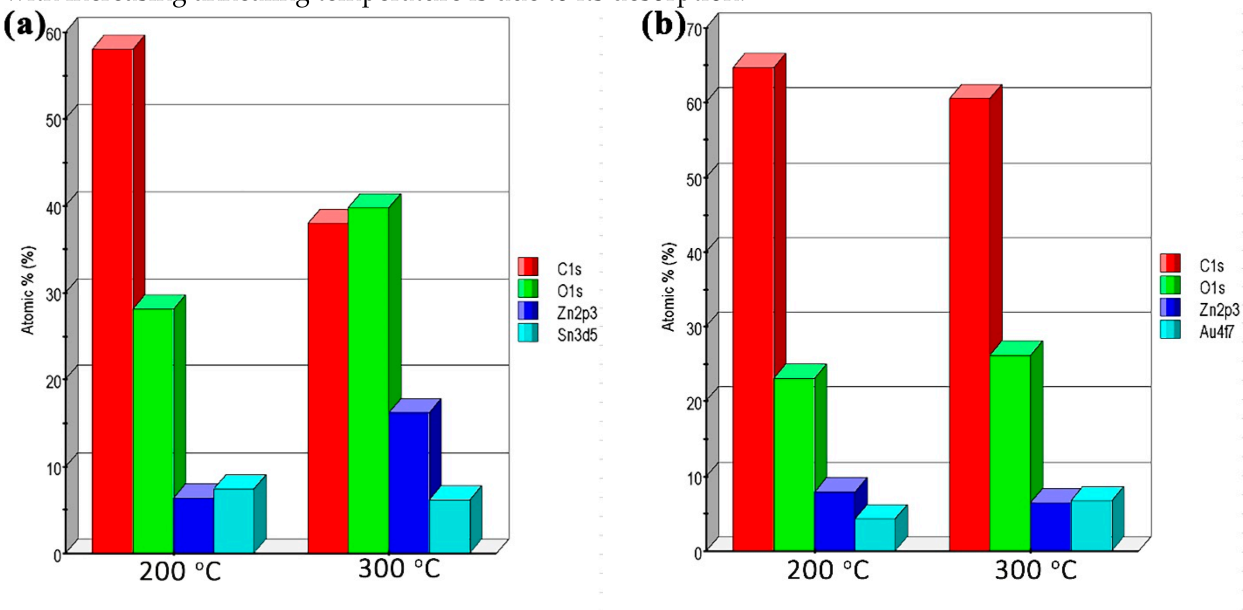

Figure S1. * High-resolution spectra of C1s photoelectronic lines Elemental composition of ZnO/Sn(2) – a and ZnO/Au(2) – b samples annealed at 200 and 300 °C.

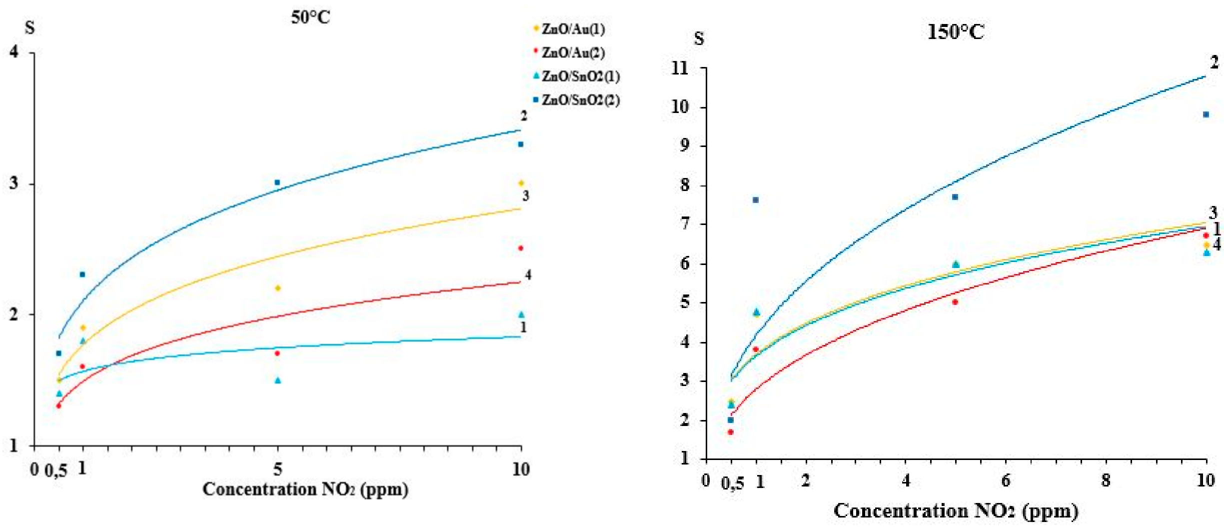

Figure S2. Calibration curves of NO_2 sensors based on ZnO/SnO_2 and ZnO/Au NR. Sample composition ZnO/SnO_2(1)-1, ZnO/SnO_2(2)-2, ZnO/Au(1)-3, ZnO/Au(2)-4.

The chemoresistive responses obtained depend on the concentration of gas C in accordance with the Freundlich isotherm $S \sim C^n$, where the power exponent n depends on the gas-sensitive material. As can be seen from the graphs, the best response has a sample based on ZnO/SnO_2(2) NRs.

The contact of zinc oxide nanorods nanocrystallites Au (a) and SnO_2 (b) is shown in Figure 3.

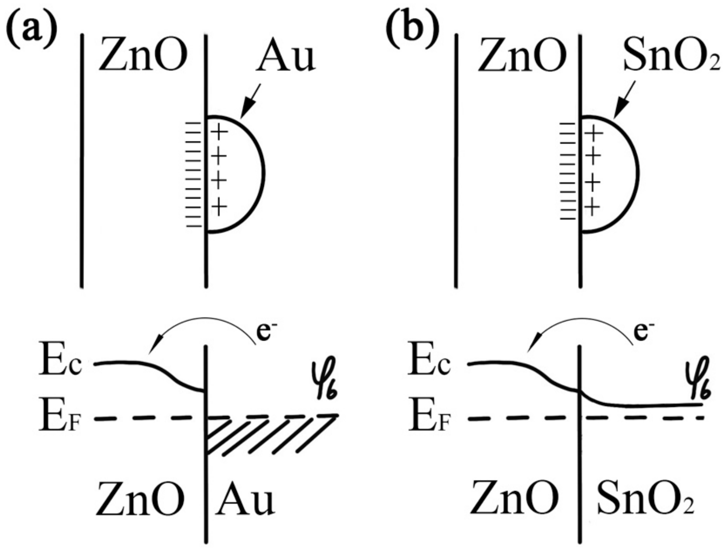

Figure S3. The contacts of zinc oxide nanorods and Au(a) and SnO_2 (b) nanocrystallites and the scheme of surface potential formation on the border of ZnO/Au - (a) and ZnO/SnO_2 (b) - heterojunctions