



Photoactive properties and AFM topography of ZnOx:MgO nanocomposite sol-gel films on the surface of silicon



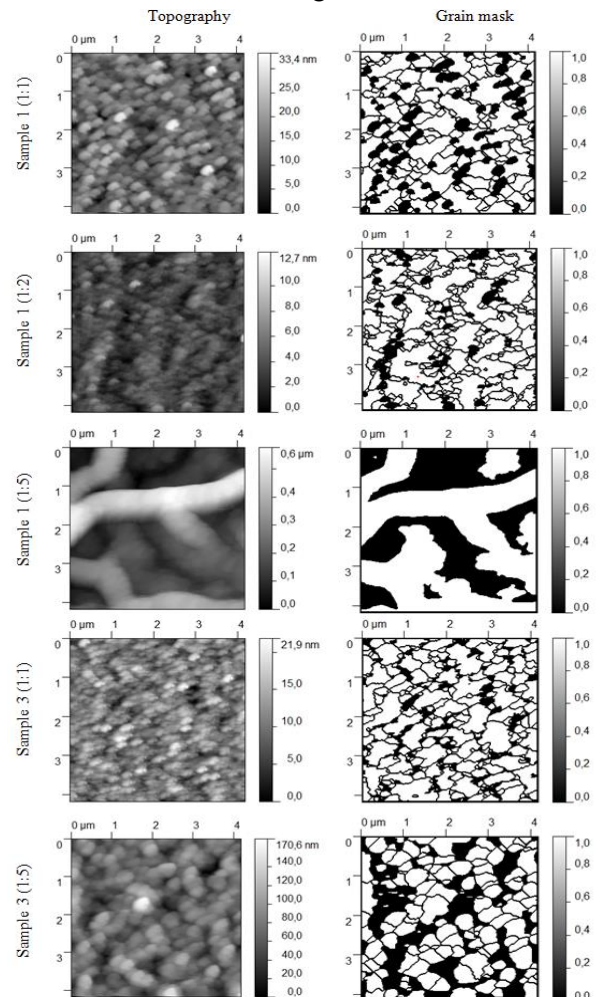
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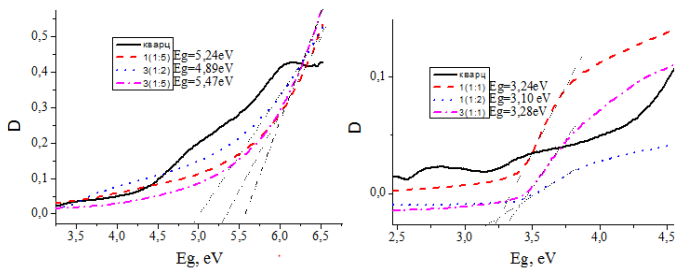
Dependence of the band gap of ZnO:Mg sol-gel films on the sol composition

Sol No. (ZnO: Mg)	1(1:1)	1(1:2)	1(1:5)	3(1:1)	1(1:2)	3(1:5)
Band gap, Eg, eV	3,31	3,36/5,21	4,68	3,28/4,72	3,21	4,77

AFM images of the surface topography of ZnOx:MgO films



Dependence of the band gap of ZnO:Mg sol-gel films on the sol composition



Parameters of the surface and band gap of ZnOx:MgO films

ZnO:Mg sample №	№1 (1:1)	№3 (1:1)
Ra, nm	3,5	114
Average grains size, nm	174	1060
Band gap, Eg, eV	3,31	3,28/4,72

The obtained ZnO:Mg/Si heterostructures (KEF 20) exhibit selective photosensitivity to UV radiation when a voltage of more than 10 V is applied. The spectral sensitivity of the heterostructure with a band gap of ZnO:Mg of the order of 4.7 eV to UV radiation (278 nm) ranged from 0.3 A/W to 3.23 A/W at a bias from 10 V to 14 V, respectively. In the rest of the studied wavelength range, the sensitivity is insignificant and close to zero.

Also, samples of coatings based on ZnOx:MgO were studied using AFM. The Gwyddion program calculated the surface roughness, the number of grains and their average size. It was found that the average grain size on the surface of ZnO films is about 200 μm, and the roughness is 0.114 μm. For films №. 3(1:1) ZnOx:MgO, the size and shape of grains increases 6 times, roughness - 1.5-2 times compared to sample № 1(1:1). The use of nitric acid leads to appearance of two separate oxide phases and to change of the size and shape of the particles ZnOx:MgO. The results obtained demonstrate the possibility of using the investigated heterostructures for solar-blind sensors.

This work was carried out with the partial support of the Belarusian Republican Foundation for Fundamental Research (grant №T21 ARMG-004).