UV PHOTODETECTOR BASED ON Ag-DOPED ZnO NANOSTRUCTURED FILMS

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At present, there exists emerging interest in the applications of wide-band gap metal oxides because of variety of applications, including detecting ultraviolet (UV) radiation and gas sensing [1]. One major factor, which stimulates the development of new UV micro-photodetectors is the growing "ozone hole" near the Antarctic linked to a increasing number of cancer and skin illnesses [2]. In this work, we present an UV detector based on nanostructured films of Ag-doped ZnO deposited using successive chemical synthesis SCS method. By varying duration and temperature of thermal annealing in furnace (TA) and rapid thermal annealing (RTA) were modified material properties and investigated its influence on the detector parameters.

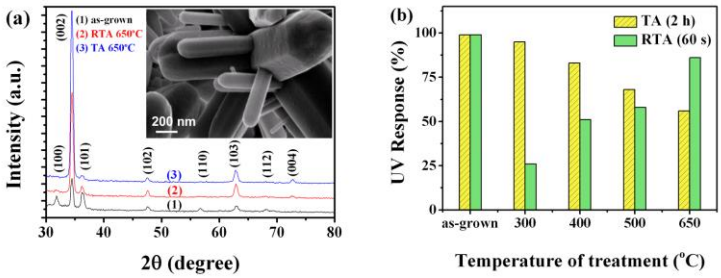

Figure 1. (a) XRD patterns of the 0.95wt%Ag-ZnO deposition: (1) as-grown, (2) RTA in air at 650 ºC for 60s, (3) TA in furnace at 650 ºC for 2 h; In inset is presented SEM image at high magnification of the as-grown sample. (b) UV response versus temperature of TA and RTA treatment of 0.95wt%Ag doped ZnO samples.

Figure 1 (a) shows the effect of thermal annealing type on the crystallinity of the SCS synthesized 0.95wt%Ag doped ZnO nanostructured films. In our investigations were compared the next samples: (1) as-grown, (2) RTA for 60 s and (3) TA treatment for 2 h, respectively. The intensity of the peaks relative to the background demonstrates good crystallinity of the hexagonal ZnO phase of the samples. A slight shift of the XRD peaks was detected due to doping of Ag in ZnO. High-magnification SEM image presented in Figure 1a(inset) indicates that layers are formed from nanocrystallites of highly crystalline nanomaterial.

Figure 1(b) shows UV response of TA and RTA annealed samples versus temperature of treatment. It can be observed that highest response is for as-grown samples, but recovery time for this samples is huge (not shown here), probably due adsorption / desorption processes of oxygen molecules on the surface. For TA treated samples was found a significant decrease or response/recovery times in UV response in dependence of annealing temperature. For RTA treated samples UV response were found to be increasing with temperature. Response time for treated samples is several times lower than for as-grown samples.

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