INVESTIGATION OF SURFACE MORPHOLOGY AND STRUCTURAL PROPERTIES OF ZNO FILMS

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- The influence of structural changes in the ZnO polymer on the morphological and optical parameters of films and the photovoltaic characteristics of solar cells was studied. To change the structure, the polymer with the electronic conductivity of ZnO was diluted with a certain concentration of isopropyl alcohol. The advantages of the properties of the modified film were determined by comparing the surface morphology.

- The preparation of substrates for photosensitive cells based on FTO was carried out according to the method [1,2]. We used $Zn_5(OH)_8Cl_2$ (99%, Ossila), Izopropanol (pure 99.9% Sigma Aldrich). ZnO films were obtained on the FTO surface by centrifugation (using a SPIN150i centrifuge manufactured by Semiconductor Production System) at a rotation speed of 1000, 1500, 3000, 4000, 5000 rpm. After that, the films were annealed in an air atmosphere at a temperature of 200 C for 15 minutes, then annealed at a temperature of 450 C for an hour.

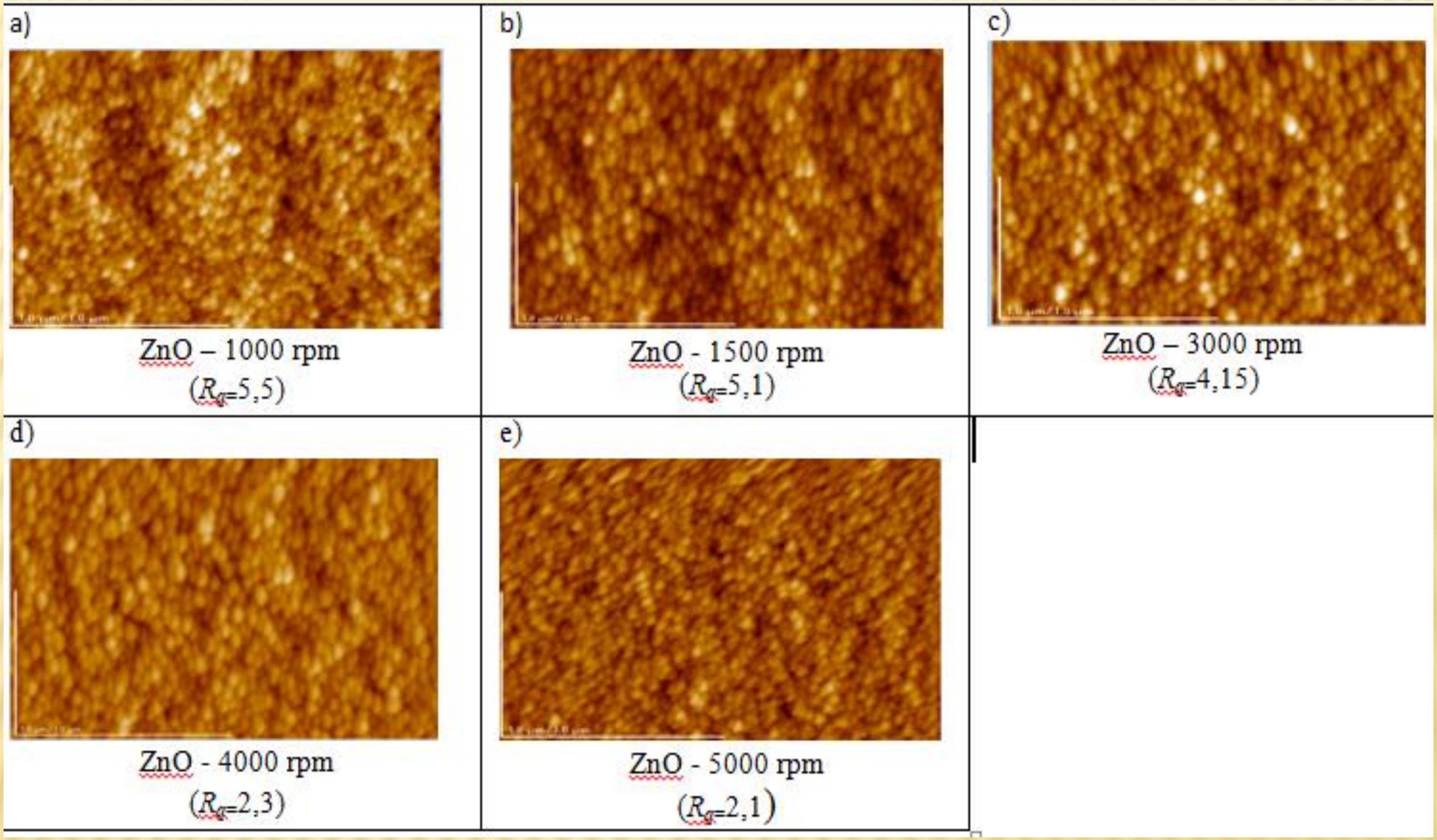

Figure 1. Images of the surface morphology of ZnO films

When studying the structure of the synthesized samples, SEM images were obtained, which show that the ZnO film has a granular structure (Figure 1). The ZnO film has a uniform structure with a roughness of $\boldsymbol{R_q}$ = 5.5 nm at a rotation speed of 1000 rpm. When the rotation speed increases, the $\boldsymbol{R_q}$ value of the film roughness decreases to the range of 5.1 – 2.0 nm (figure 2 a, b, c, d, e).

We assume that there is an optimal ZnO film thickness where there is a balance between transport and recombination. A cell with the optimal ZnO thickness will have the maximum charge carrier lifetime.

Experiments showed that when the thickness of the ZnO layers increased from 10 nm to 100 nm, similar grain sizes and surface morphology were observed, which led to significant changes in the performance of the device

References (Times New Roman, bold, 10 pt, left aligned)

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