SYNTHESIS OF ZNO FILMS FOR SOLAR SELLS BY SOL-GEL METHOD

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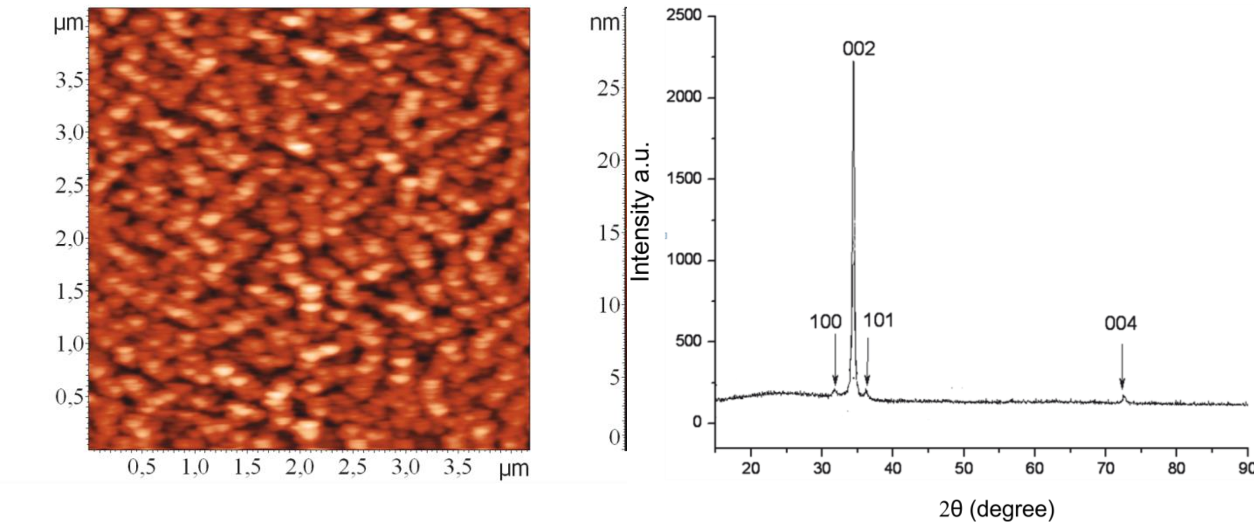
The possibility of functional nanostructured materials for electronic devices synthesis by sol-gel method have been shown. ZnO films were carried out by centrifugation. For manufacturing the precursor (sol), the required amount of zinc acetate filled into absolute isopropyl alcohol (or DMF or 2-methoxyethanol according to the sol type) and stirred. Then sol was stirred for 30 minutes. Sol was kept at the room temperature (22±2) °C for 2-3 days. Monoetalamin was selected as the catalyst because of reducing the exposure time of to two days and ensure their stability during the month. After applying the sol onto the surface of glass, single crystal silicon etc , the samples were placed in the furnace and were heated stepwise at intervals of 20 °C to the temperature of 350 °C for 10 minutes. The process of applying and drying was repeated until the desired thickness of the ZnO layer. AFM and XRD (fig. 1) investigation confirmed the high homogeneity of the films and their suitability for use in solar sells.



a b

Fig. 1 – AFM (a) and XRD spectrum (b) of ZnO:Al sol-gel films

The sol-gel films also can be manufactured with relief film surface for use as holographic concentrator in solar cells. Solar cells using holographic concentrators have such advantages as the lightness and the minimum of thickness. Also the advantage of holographic solar cells is the selection of the light frequencies, leading to high efficiency of photovoltaic cells without overheating ("thermal" part of the spectrum misses photocell). Such type of solar cells do not require turning mechanism. The holographic solar cells compared with solar panels without concentrators require 50-85% less silicon to produce one watt. In this case, the holographic solar sells is much cheaper then large mirrors or lenses.

Organic-inorganic optical layers thicker than 1 mkm with a relief surface were synthesized by sol-gel method on the surface of the glass substrates (Fig. 2). The height of one step is about 5 microns.

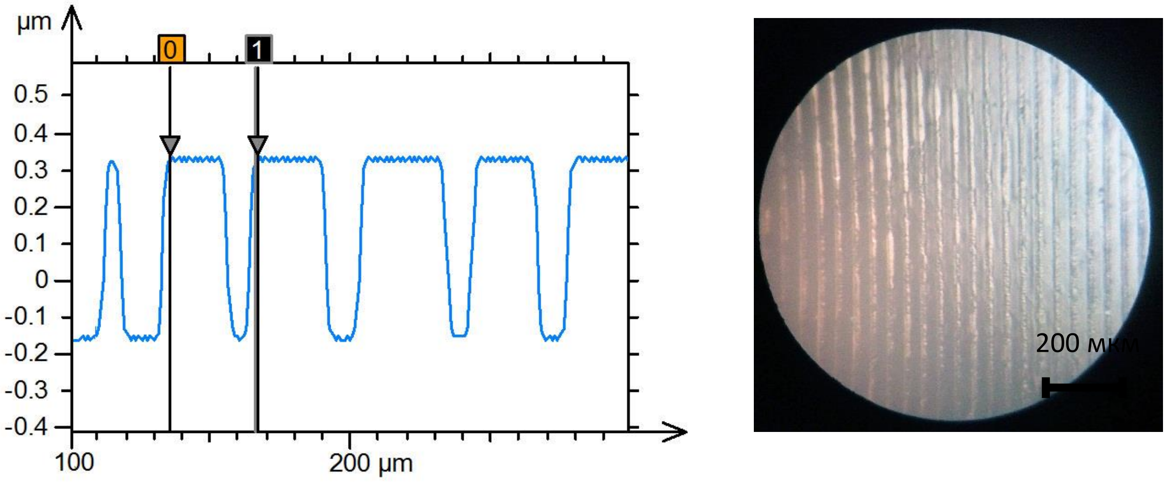


Fig. 2 - The surface topography and the micrograph of the sol-gel film with relief surface

The application of sol-gel method will provide holographic concentrators replacing expensive solar cells by relatively cheap optical systems.