COMPREHENSIVE STUDY OF STRUCTURAL AND OPTICAL PROPERTIES OF ZnO THIN FILMS GROWN IN VARIABLE CONDITIONS

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The research correlated with finding the most affordable materials for modern electronics seems to be one of the main goals for material science nowadays. Due to their wide, direct bang gap, II-IV compounds seem to be applicable in innovative electronics [1]. One of them is zinc oxide (ZnO). ZnO monocrystal exhibits wide band gap around 3.3 eV (which occurs at crystallization to wurtzite-type structure), high transparency and relatively low optical absorbance [2]. As grown, ZnO shows n-type conductivity; nevertheless thin film deposition techniques allow p- and n-type doping [3].

The most popular way to achieve material for an electronic purpose is thin layer's growing. In most cases, thin layers of ZnO crystallize to zinc blend or wurtzite structure from amorphous film in high temperature. The sol-gel technique, due to an ease low cost of production and deposition, is one of the most popular methods of obtaining a functional films for optoelectronics. However, besides of numerous research focused on properties of acquired layers [4], the universal method of achieving repeatable samples is still not developed. What is more, the process does not enable to acquire high quality layer during the process. However, this can be achieved by post-processing, where the recrystallization of films can be used [4].

Understanding the course of the recrystallization process – with a special consideration of the influence of the crystal growth kinetics on the substrate's orientation and the presence of defects – seems to be one of the main goal in development of methods for sol-gel synthesis of thin films on amorphous substrates [2].

The main goal of the presentation is to establish the influence of different conditions of annealing on thin films of ZnO produced with spin coating method from sol on their structure and properties. Therefore, the main element of the work was to assess the structure of the obtained samples using microscopic methods. Besides of micrographs, the quality of crystal can be successfully determined using Raman microscopy investigations. Our purpose, besides of evaluation of crystal structure, was to observe localized vibrational modes connected with changes in structure, which can occur with growing of a thin layer process. For complementary information UV-VIS absorption and photoluminescence measurements were conducted.

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