Nanostructured surfaces

The structure and optic properties of ZnO thin films deposited by reactive ion beam sputtering

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Zinc oxide (ZnO) as wide-band gap semiconductor is a promising material for design of optical devices such as light-emitting diodes, laser diodes and UV detectors due to unique optical properties as well as relative low cost, non-toxicity, advantages in technology and resistance to radiation damage of ZnO. Recently, a great attention has been given to the growth and processing of ZnO films and different devices on its basis. The growth of high quality ZnO films with n-type and p-type conductivity is very important goal of present material science and physics.

The diverse physical and chemical vapour deposition methods such as magnetron sputtering, pulsed laser deposition, plasma-enhanced chemical vapour deposition, electrochemical deposition, sol–gel, spray pyrolysis, etc. have been used for ZnO films deposition.

The reactive ion beam sputtering (RIBS) is considered to be most interesting growth method due to a good films adhesion, its high deposition rates, films uniformity of over large areas of the substrates and very smooth surface of deposited films that is important for the optoelectronic applications. However, to our best knowledge, the influence of technological parameters on structure and optic properties for ZnO grown by RIBS method has not been studied yet in details.

Therefore, our report was devoted to the investigation of such RIBS technological parameters influence as substrate temperature and accelerating voltage on structure and optic properties of ZnO thin films deposited on Si (100) and glass substrates. The properties of as-grown ZnO films were studied by X-ray diffraction and optical transmission/reflection measurements. Obtained results were discussed and analyzed.