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Depositon of Transparent Conductive Films by a DC arc Plasmatron

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In the present work, we studied effect of the deposition parameters on the structure and properties of ZnO films deposited by DC arc plasmatron. The varied parameters were gas flow rates, precursor composition, substrate temperature and post-deposition annealing temperature.

Vapor of Zinc acetylacetone was used as source materials, oxygen was used as working gas and argon was used as the cathode protective gas and a transport gas for the vapor. The plasmatron power was varied in the range of 700-1,500 watts. Flow rate of the gases and substrate temperature rate were varied in the wide range to optimize the properties of the deposited coatings. After deposition films were annealed in the hydrogen atmosphere in the wide range of temperatures.

Structure of coatings was investigated using XRD and SEM. Chemical composition was analyzed using x-ray photo-electron spectroscopy. Sheet conductivity was measured by 4-point probe method. Optical properties of the transparent ZnO-based coatings were studied by the spectroscopy.

It was shown that deposition by a DC Arc plasmatron can be used for low-cost production of zinc oxide films with good optical and electrical properties. Sheet resistance of 4 Ohms·cm was achieved after the deposition and 30 min annealing in the hydrogen at 350°C. Elevation of the substrate temperature during the deposition process up to 350°C leads to decreasing of the film's resistance due to rearrangement of the crystalline structure.