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OPTICAL AND ELECTRICAL BEHAVIOR OF THIN ZnO:AI FILMS WHEN CONFRONTING OTHER TRANSPARENT CONDUCTING OXIDES

Semiconductor materials by nature have high optical transparency and are good electrical insulators, but we can improve their properties through some impurification or also called doping, obtaining materials with high optical and electrical transparency. Transparent conductive oxides or also called TCO's are electrically conductive materials with high optical transparency. They are used in a variety of applications, particularly for flat screens, solar cells, etc....The most used TCO is ITO or also called indium-doped tin oxide, however, indium is a rare element on Earth. For this reason, in this work we took on the task of studying the optical and electrical properties of zinc oxide doped with aluminum or AZO in order to obtain properties similar to ITO and thus propose it for these applications. 5 samples were synthesized, using the laser ablation or PLD technique, ablating two targets simultaneously under an oxygen atmosphere, keeping the Zn plasma constant and varying the Al plasma with the support of a Plasma diagnostic technique such as the Langmuir probe and commercial conductive FTO and ITO glasses were used for this study. This work presents a study on the optical and electrical properties of aluminum-doped zinc oxide thin films in contrast to other popular transparent conductive oxides such as FTO and ITO. The films were analyzed by UV-Vis spectroscopy and subsequently the electrical resistance of the films was measured using the four-point technique to calculate their resistivity, subsequently the film with the best properties was chosen and contrasted with those of the FTO and the ITO. The results showed that AZO presents the best optical and electrical properties compared to the other two oxides with a transparency of 93% and a resistivity of 1.6x10-6 Ω m. With this we can say that AZO can be considered for the manufacture of different electronic devices.

Keywords

semiconductors, plasma parameters, conductive oxides, laser ablation, thin films.

Reference

J. A. Guerrero de León et al., "Influence of the Zn plasma kinetics on the structural and optical properties of ZnO thin films grown by PLD,"SN Appl Sci, vol. 1, no. 5, May 2019, doi: 10.1007/s42452-019-0497-1.

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Author approval

I confirm

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