Pankaj Sharma et al., J Material Sci Eng 2017, 6:2 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.061

conferenceseries.com

3rd International Conference on

Smart Materials & Structures

March 20-22, 2017 Orlando, USA

Fabrication of low resistive and stable Li-P co-doped *p*-type ZnO by dual ion beam sputtering

Pankaj Sharma, Ritesh Bhardwaj, Amitesh Kumar, Rohit Singh and **Shaibal Mukherjee**
Indian Institute of Technology Indore, India

In the last decade, Zinc oxide (ZnO) based optoelectronic devices have attracted much attention due to their superior material properties such as wide direct band gap energy, large exciton binding energy, high radiation resistance and chemical and thermal stability. However, the lack of availability of reliable and stable *p*-type ZnO has always remained a concern in order to fabricate these devices. Various groups have reported *p*-type ZnO by doping with different elements of group V, whereas others have also used co-doping approach for achieving *p*-type conduction in ZnO. Unfortunately, the high resistivity and low hole concentration still poses limitations for high performance devices. In this work, we report the fabrication of high hole concentration, low resistive and stable Li-P co-doped ZnO (LPZO) thin films. LPZO thin films were fabricated by DIBS technique on low resistive *n*-type Si substrates. The deposition was performed using high quality ceramic target having Li and P content of 5% and 3% respectively, in oxygen rich ambient at 300°C and 500°C. Post deposition annealing was carried out in N2 ambient at 800°C for 20 minutes to activate the acceptor dopants. The XRD pattern of annealed LPZO film confirmed that crystal structure was preferentially oriented in *c*-axis (002) direction. FWHM of (002) peak was calculated to be 0.24° resulting in a crystallite size of ~35 nm. It shows the schematic structure of *p*-LPZO/*n*-Si heterojunction with linear I-V curves of ohmic contacts. Hall measurement was performed in the van der Pauw configuration to measure the electrical parameters e.g., carrier concentration, resistivity and mobility. The annealed LPZO films clearly depicted *p*-type conduction as observed from the rectifying behavior. A relatively higher hole concentration of the order 2×10^{20} cm^{-3} and resistivity of 8×10^{-3} Ω.cm were calculated. The turn-on voltage of the diode was determined to be 1.6 V whereas the rectification ratio of forward to reverse current at ±3 V was 76.

Biography

Pankaj Sharma is currently pursuing his PhD degree in Electrical Engineering at Indian Institute of Technology Indore since 2014. He has completed his Masters in VLSI Design from Delhi, India. His research work includes fabrication and characterization of ZnO thin films using dual ion beam sputtering technique for optoelectronic applications. He is presently working on realizing low resistive and high hole concentration ZnO thin films by using various acceptor dopants.

phd1301202009@iiti.ac.in

Notes: