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Deep-Level Defects on Nitrogen-Doped ZnO by Photoinduced Current Transient Spectroscopy

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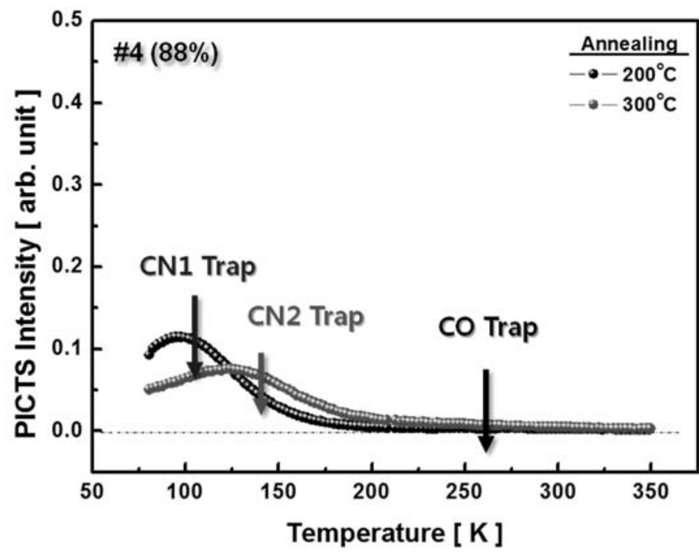
Recently, ZnO has received attentionbecause of its applications in optoelectronics and spintronics. In order to investigate deep level defects in ZnO, we used N-doped ZnO with various of the N-doping concentration. which are reference samples (undoped ZnO), 27%, 49%, and 88%-doped ZnO. Photoinduced current transient spectroscopy (PICTS) measurement was carried out to find deep level traps in high resistive ZnO:N. In reference ZnO sample, a deep trap was found to located at 0.31 (as denoted as the CO trap) eV below conduction band edge. And the CN1 and CN2 traps were located at 0.09, at 0.17 eV below conduction band edge, respectively. In the case of both annealed samples at 200 and 300°C, the defect density of the CO trap increases and then decreases with an increase of N-doping concentration. On the other hands, the density of CN traps has little change according to an increase of N-doping concentration in the annealed sample at 300°C. According to the result of PICTS measurement for different N-doping concentration, we suggest that the CO trap could be controled by N-doping and the CN traps be stabilized by thermal annealing at 300°C.

Keywords: ZnO, Zinc oxide, PICTS, Photo-induced current transient spectroscopy, Defect, Nitrogen doping


#4 (88%)
Annealing
200°C
300°C
CN1 Trap
CN2 Trap
CO Trap
PICTS Intensity [arb. unit]
Temperature [K]
0.5
0.4
0.3
0.2
0.1
0.0
50
100
150
200
250
300
350