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Defects engineering in shallow acceptors in $Zn_{0.8}Al_{0.2}O$ alloy via N^+ ion beam irradiation

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Here, we find that N^+ ion beam irradiation with an energy of 40 keV may create oxygen-related shallow acceptors in $Zn_{0.8}Al_{0.2}O$ alloy. After the N^+ beam irradiation with a fluence of 1×10^{16} ions/cm^2 (N16) a newly emerged signal with g=2.007 in electron spin resonance (ESR) spectroscopy corresponds to a longer decay time τ=15.6 ns in time-resolved photoluminescence spectroscopy and is then assigned to oxygen interstitial acceptors which have activation energy in a range of 26±3 meV to 38±5 meV. No hyperfine peaks in the ESR spectra may exclude the defects from N-related acceptors, although we irradiated N^+ ions into the samples. In x-ray photoelectron spectroscopy, we find the peak shift towards higher energy, indicative of the complete oxidation of the N16 films from the Zn 2p peaks. In this heavily doped alloy, the amorphous structure may be found in the samples before and after irradiation, allowing us to some new defects introduced by ion beam irradiation.

Paper submission Plan

No

Best Presentation

Yes

Contribution track

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