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Investigation of defects in sputter deposition deposited Schottky barrier diodes on epitaxial GaAs by Laplace DLTS

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High resolution deep level transient spectroscopy (Laplace DLTS) was used to study Si doped n-type epitaxial GaAs. In this work, we used Au as the target material for the deposition of GaAs samples by sputtering deposition system. Three different doping densities of GaAs (1x10¹⁵ cm⁻³, 1x10¹⁶ cm⁻³ and 8x10¹⁶ cm⁻³) were deposited with 3 different powers 100 W, 150 W and 200 W for 10 minutes. From the Arrhenius plot, we found 3 defects with deferent energy levels (0.58 eV, 0.50 eV and 0.31 eV). The E_c- 0.50 eV defect is dopant dependent while the other two (0.58 eV and 0.31 eV) did not involve dopant atom. The E_c - 0.58 defect is bistable with the E_c - 0.31 eV defect, Under 0 V bias for 5 minutes, the E_c - 0.31 eV transforms to E_c - 0.58 eV and by applying the reverse bias the E_c - 0.58 eV transforms to E_c - 0.31 eV. This transformation is completely reversible. These results are the same as the results achieved by inductivity coupled plasma etching of GaAs [1]. The results from current-voltage measurements indicate that current reverse is a substantially higher compared to that of resistivity evaporated Schottky diodes.

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