Contribution ID: **140** Type: **Poster**

Characterization of Junction Parameters in n-Type Nanocrystalline Iron Disilicide/Intrinsic Ultrananocrystalline Diamond/Amorphous Carbon Composite/p-Type Silicon Heterojunctions

n-Type nanocrystalline (NC) iron disilicide (FeSi2)/intrinsic (i) ultrananocrystalline diamond/amorphous carbon composite (UNCD/a-C)/p-type Si heterojunctions were successfully prepared by employing pulsed laser deposition (PLD) and coaxial arc plasma deposition (CAPD). Their dark current density-voltage (J-V) curves were measured and analyzed at low temperatures ranging from 300 K to 80 K in order to estimate the junction parameters by using thermionic emission theory (TE), Chuang's, and Norde's methods. According to the estimation by TE theory, the ideality factor (n) were 1.12 at 300 K and 5.44 at 80 K. The barrier height was 0.69 eV at 300 K and it decreased to 0.20 eV at 80 K. These parameters are in agreement with those estimated by using Chueng's and Norde's methods. The series resistance (Rs) estimated by Chueng's method were 300.88 Ω at 300 K and 4.29 MΩ at 80 K. These Rs values are equal to those estimated by using Norde's method.

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Track Classification: Nanomaterials & nanostructures