Journal of Ovonic Research Vol. 19, No. 4, July - August 2023, p. 359 -367

Thermal annealing effects on the electrical characteristics of alpha particles irradiated MIS device AuTa2O5GaAs

Abstract

An alpha particle-irradiated MIS device made of AuTa2O5GaAs was used to study how thermal annealing affects the I-V characteristics and how the current changes with annealing temperature, radiation energy, and voltage biassing. The super-gate of the MIS structure was made by using thermal evaporation to build a 1000°A thick layer of gold under a vacuum of about 10-5 torr. At room temperature, the devices were exposed to alpha particles from the radioactive source 226Ra (0.5 Ci) with energies of 5.1, 4, 3, 1.8, and 1.2 MeV for 0–30 minutes. After 30 minutes of annealing at 150, 200, and 300 oC in a vacuum of 10-3 torr, the current-voltage (I-V) characteristics of the irradiation devices were found. During thermal annealing, different results were seen with bias voltages of 0.4, 1, and 2 V and temperatures of 150, 200, and 300 oC. Annealing the device at 150 oC doesn't change how stable it is, but annealing it at 300 oC causes ohmic conduction in the device's properties. The device's current can be fixed best when the device is heated to 200 oC and then cooled. Also, thermal annealing seems to have different effects on the I–V electrical characteristics of the devices depending on the energy of the particles and the voltage biassing