Abstract

Gallium Arsenide (GaAs) has been used widely in electronic industry to make diodes and transistors. As a semiconductor, it can be doped up with impurities with magnetic properties such as manganese to increase its electron conductivity. The storage capacity of the electronic devices made of gallium manganese arsenide (Ga1-xMnxAs) and the proportion of manganese atoms is worth studying. Here, GaAs was doped at different manganese levels, x, and the charge carrier concentrations at varied applied magnetic fields was investigated using Van der Pauw configuration. The tests were conducted at room temperature of 230C with magnetic field, $0.9 \leq B \leq 3.6$mT and direct current of 1.19A. All the samples were studied for their hall voltage VH, carrier mobility μ, hall resistivity ρH and charge carrier concentration for different values of x. It was determined for Ga1-xMnxAs, $10\% \leq x \leq 20\%$ range, has maximum hall resistivity at B≈ 1.9 mT. For x=10%, 44.0 . ρ H ≈ Ω m ; x=20%, 79.0 . ρ H ≈ Ω m and for x=1%, the applied magnetic field has no effect on hall resistivity at initial states until B≈1.7mT. Beyond this point, magnetic field increases linearly with the hall resistivity to a maximum of 72.0 . ρ H ≈ Ω m . Maximum hall resistivity for x=50% was 2596.0 . ρ H ≈ Ω m at B mT ≈ 0.9 . For 0 20% ≤ ≤ x , carrier mobility μ , was of order of 7 2 1 1 10 m V s − − − while for x = 50% , μ was of order 9 2 1 1 10 m V s − − − . It was found out that the most probable doping percentage of GaAs with Mn dopants is approximately 20% and 10% as they show a hysteric response to an applied magnetic field. It suggests a good doping level of GaAs for making of volatile memory chips.