TUNNELING SPECTROSCOPY AND MINIBAND STRUCTURE OF SELENIUM δ-DOPED GaAs

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Tunneling experiments have served as a means of directly determining subband energies for a two-dimensional electron gas (2DEG) system. In this work we investigate the quantum tunneling at 4.2K from the subbands of a Selenium δ-doping layer through a Schottky barrier depletion region. These sample was grown by molecular beam epitaxy. The sheet of donor atoms is embedded in GaAs only 200 A below the surface. The energies of occupied and unoccupied levels are determined from distinct structures in the first derivative. The subband energies observed in Se-doped GaAs are in good agreement with those calculated by Thomas-Fermi semiclassical model and self consistent methode. On the other hand. the spatial localization of dopants is assessed by the Capacitance-Voltage at 77K. The subsequent annealing experiments reveal that significant dopant diffusion at 700 °C has taken place.

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Additional page for support information

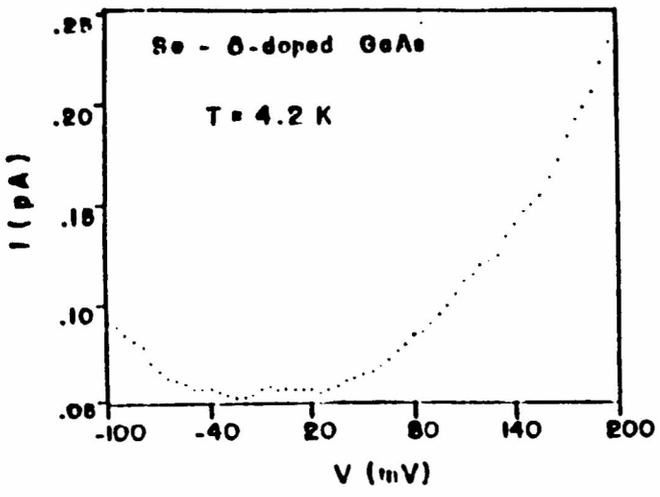

Fig.1. Tunneling current VS gate voltage at temperature 4.2K

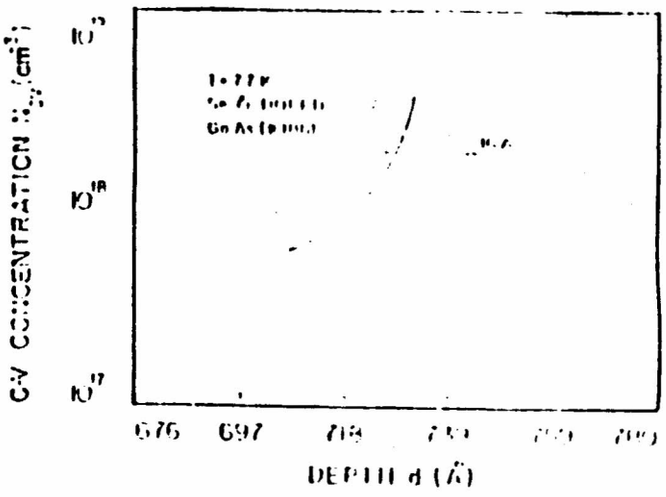

Fig.3. C-V profile measured at 77K.

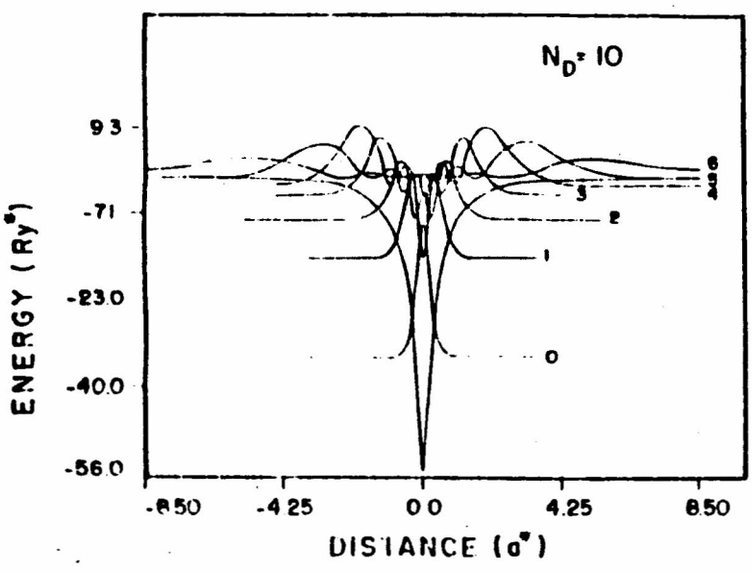

Fig. 2. The Thomas-Fermi δ-doping potential well.

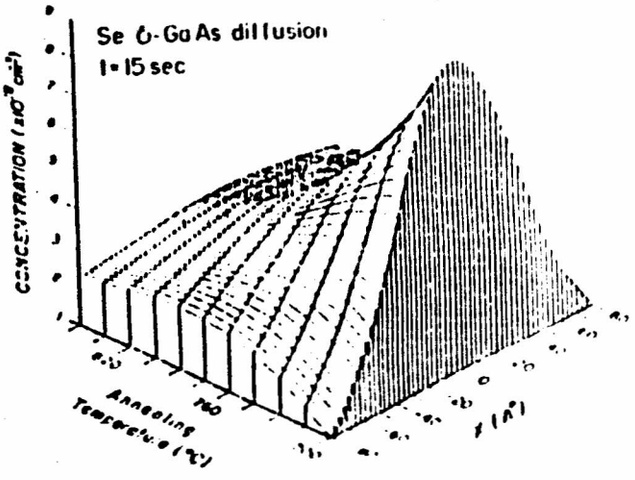

Fig.4. Se δ-doped GaAs diffusion with Gaussian distribution function.

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