World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:16, No:02, 2022

3D Simulation and Modeling of Magnetic-Sensitive on n-type Double-Gate Metal-Oxide-Semiconductor Field-Effect Transistor (DGMOSFET)

Authors : M. Kessi

Abstract : We investigated the effect of the magnetic field on carrier transport phenomena in the transistor channel region of Double-Gate Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET). This explores the Lorentz force and basic physical properties of solids exposed to a constant external magnetic field. The magnetic field modulates the electrons and potential distribution in the case of silicon Tunnel FETs. This modulation shows up in the device's external electrical characteristics such as ON current (ION), subthreshold leakage current (IOF), the threshold voltage (VTH), the magneto-transconductance (gm) and the output magneto-conductance (gDS) of Tunnel FET. Moreover, the channel doping concentration and potential distribution are obtained using the numerical method by solving Poisson's transport equation in 3D modules semiconductor magnetic sensors available in Silvaco TCAD tools. The numerical simulations of the magnetic nano-sensors are relatively new. In this work, we present the results of numerical simulations based on 3D magnetic sensors. The results show excellent accuracy comportment and good agreement compared with that obtained in the experimental study of MOSFETs technology.

Keywords : single-gate MOSFET, magnetic field, hall field, Lorentz force
Conference Title : ICMN 2022 : International Conference on Microelectronics and Nanotechnology
Conference Location : Barcelona, Spain
Conference Dates : February 15-16, 2022