



Progress Seminar

Seminar : Optimized Grooved/Recessed FinFET structure as Gas sensor for Hydrogen, Ammonia and Hydrogen Sulfide gases.
Title

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Venue : Seminar Room, EE Department (Room No. 401)

Date & : 30 Sep 2022 (11:00 AM)
Time

Abstract : A grooved channel, or raised source and drain junctionless FinFET (Fin Field effect transistor), has been developed in this study as a gas (H₂, H₂S, NH₃) sensor. The Visual TCAD simulator examines the response of junctionless FinFET for hydrogen gas detection. Platinum is employed as a catalytic metal gate. Variations in the concentration of gas molecules alter the pressure on the catalytic metal gate, influencing the metal work function. The presence of hydrogen, Hydrogen sulfide, or Ammonia is detected by the change in metal gate work function. The surface potential, threshold voltage, drain current, and transconductance of the developed gas sensor were extracted and analyzed. The device performance is tested for hydrogen gas concentration from 10⁻¹⁴ torr to 10⁻¹⁰ torr. Before the 3D structure, study and analysis has been done in planar 2D structure. A novel 20nm symmetrical grooved gate structure with 8nm gate height is proposed and compared, which exhibits better drain current, transconductance, trans generation factor (TGF), and Ion/Ioff ratio compared with other 20nm (effective channel length) symmetrical FinFET structures at 3nm, 5nm, and 8nm gate heights. The design is optimized in terms of doping variation and gate expansion styles in the first step further performance is improved by changing the gate height. The FinFET with positive fin height and the structure with grooved gate are simulated. The obtained characteristics are analyzed and compared with the 2D/3D Visual TCAD device simulator utilized in designing all FinFET structures.