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Silicon sensor design with TCAD simulation

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The Technology Computer Aid Design (TCAD) is a simulation framework of semiconductor processing, device operation and interconnect characterization for technology development and manufacturing. The collaboration between Suranaree University of Technology (SUT) and Thai Microelectronics Center (TMEC) aims to design a sensor prototype for particle tracking. The TCAD software at TMEC is used to simulate a semiconductor diode which is placed into this sensor. In this work, device operation as part of the TCAD is used to simulate TMEC's power diode ($P^+N^-N^+$ diode). As an input parameter, we import a Spreading Resistivity Profile (SRP) as a diode model structure into the TCAD software. In the SRP, the doping concentrations of P^+ and N^- layers are around 10^{18} cm^{-3} and 10^{14} cm^{-3}, respectively. In the N^+ layer, however, the concentration cannot be measured due to a limited depth of the SRP. Experimental data from the Electrical Characteristics Measurement (current, capacity) is compared to simulation results from the TCAD. We find that current, as well as capacity obtained from our simulation, are in good agreement with the experimental measurements.

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