

## MOSCap Tool on nanoHUB.org

The primary reason to study MOS (metal-oxide-semiconductor) capacitors is to understand the principle of operation as well as become familiar with some of the routinely used characterization techniques for MOS field effect transistors (MOSFETs). The MOSCap tool on nanoHUB.org simulates the one-dimensional electrostatics in single and dual-gate MOS device structures along the growth direction as a function of device dimension, oxide charge, temperature, doping concentration, and AC frequency. Among the quantities simulated, the low and high-frequency capacitance-voltage (CV) characteristics and various spatial profiles (energy band, electric field intensity, charge densities, and surface potential) are of special importance. In this chapter, we will describe: 1) Structure and basic operational principle of an MOS capacitor; 2) User interface of the MOSCap simulator; 3) How to prepare an input deck and sample simulations (examples); 4) Outputs and the major technologically important information that can be extracted from the simulation results; and 5) Limitations of the MOSCap tool. The chapter is expected to increase comprehension of the operation and applications of both conventional and novel MOS capacitors from a semi-classical viewpoint. For a quantum-mechanical description of capacitance in a MOS structure, please see the Chapter on the Schred tool.