Recitation 1: IC Technology

How are integrated circuits being designed and fabricated?

1. IC Design: application → circuits → design: design tools include layout, place and route, circuit simulation, etc

2. Fabrication and Integration:

   (a) What material that allows the development of microelectronics? a class of materials called "semiconductors"

   - two types of "carriers" - electron and hole (the missing of an electron)
   - carrier concentrations can be controlled over many orders of magnitude by doping and electric field effects.

   Examples of semiconductors: GaAs, GaN, **Si**, Ge. This class will focus on Si.

   (b) How to make Si wafers (from sand, crystal growth . . . ?)

   (c) Fabrication

   - Defining area: "Lithography" (mostly in industry - **photolithography**)
   - Cutting out material = "etching" (wet vs. dry)
   - Insulation= SiO_2 (oxide) or Si_3N_4 (nitride), oxidation or nitride deposition
   - Tuning conductivity (carrier concentration) = doping (ion implantation)
   - Metallic wiring (interconnect): Al now Cu
   - Chemical-mechanical polishing (CMP)

   (d) The heart of microelectronics

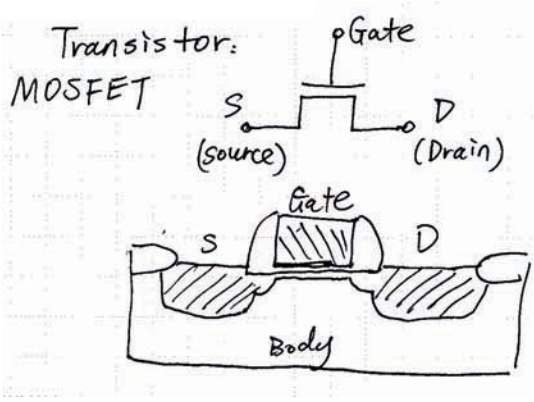

Figure 1: The Transistor

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