Silicon Wafer Manufacturing

- Silicon single crystal (diamond cubic structure) ingot is typically grown by a Czochralsky (CZ) method by placing a single crystal seed into the top of a silicon melt, first at high speed and then slowly pulled from the melt while crystal growth is happening.
- The ingot is cut to above the desired wafer diameter, then a notch or a flat side are formed to indicate the crystallographic orientation (e.g. [100])
- After inspecting for defects the ingot is slices into wafers which are then thinned and polished to low roughness and high surface quality.
- Most wafers are single side polished (SSP) but some are double side polished (DSP). Then they are cleaned using chemical processing, dried and packaged.
- Silicon ingots can be doped in-situ by adding dopants to the melt used to grown the ingot. P-type silicon will be doped with B (group III), creating charge carriers of “hole” type, and N-type silicon will be doped with P, As, or Sb (group V) creating electron charge carriers.