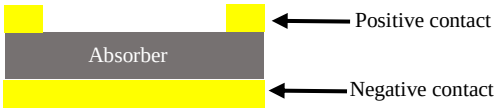
For this project, you'll design a solar cell with the following structure:




For this structure, you'll optimize the thickness and doping for the absorber layer for maximum power conversion efficiency, under illumination from the Sun. Your group can choose any of the following material as the absorber (first come first offered):

1. Lead halide perovskite (any composition reported in the literature)
2. GaAs
3. Polycrystalline Silicon
4. Monocrystalline Silicon
5. CIGS
6. CdTe

We will assume the generated electron-hole pairs are readily separated by the contacts and collected, and we'll use a constant value of series resistance $R_s$ and shunt resistance $R_{sh}$ as an input to the simulation.

Download the code in the GitHub link. You'll only need to use the SimParams.m file to inputs to the simulation, and run PV_JV.m to obtain the output $V_{oc}$, $J_{sc}$, FF, $V_{mpp}$, and $I_{mpp}$.

**Task 1: Reproduce the Shockley-Queisser limit**.

Plot the solar cell efficiency vs bandgap, when the Sun is a blackbody emitter at 6000K, and the solar cell is at 300K. Assume perfect material quality for the solar cell and step-function absorptivity of the solar cell. (**Due Mon April 6**)

**Task 2: Find the material parameters**

From literature, find the absorption coefficient as a function of wavelength, SRH lifetime, electron and hole effective mass, surface recombination velocity, electron and hole Auger

recombination coefficient at 300K, for the material of choice in your group (**Due Mon April 6**).

Task 3: **Plot the solar cell efficiency vs the thickness of the absorber layer**. What determines the optimum thickness? (**Due Mon April 13**).

Task 4: Doping optimization, and EQE calculation.

Plot doping vs solar cell efficiency, and find the optimum doping for your solar cell. Also, report the EQE as a function of wavelength in your solar cell. (**Due Mon April 20**)