

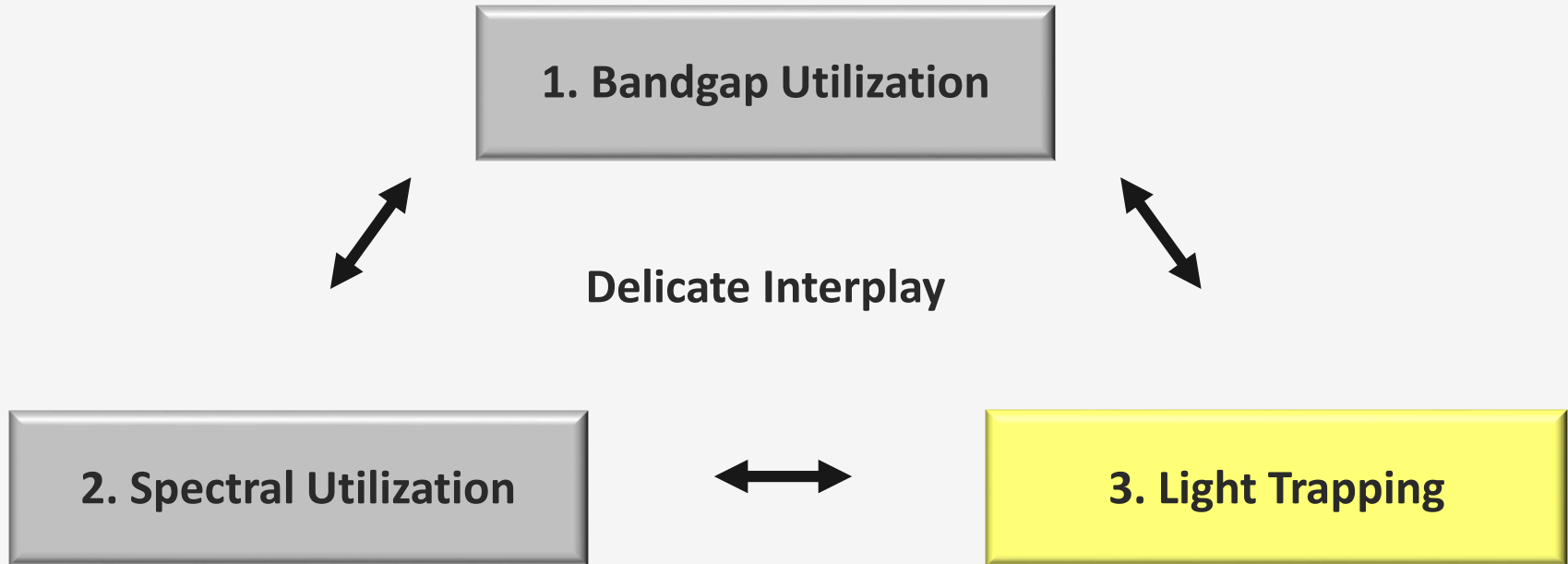
Solar Cell Operation, Performance and Design Rules

Light Trapping I - Absorption and Loss Mechanisms

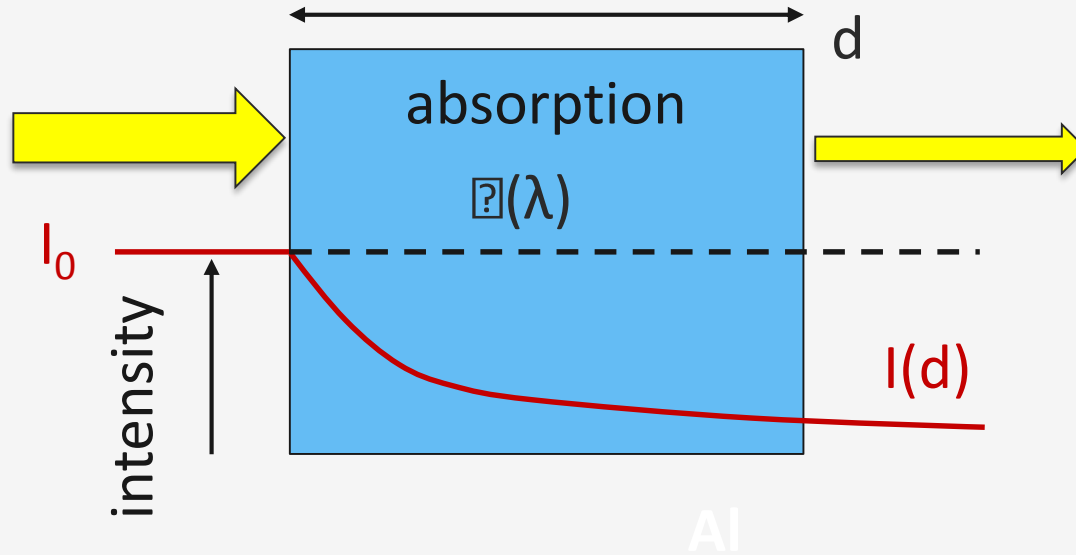
Week 3.3.4

Arno Smets

Design Rules Solar Cells



Light absorption: Lambert-Beer's law



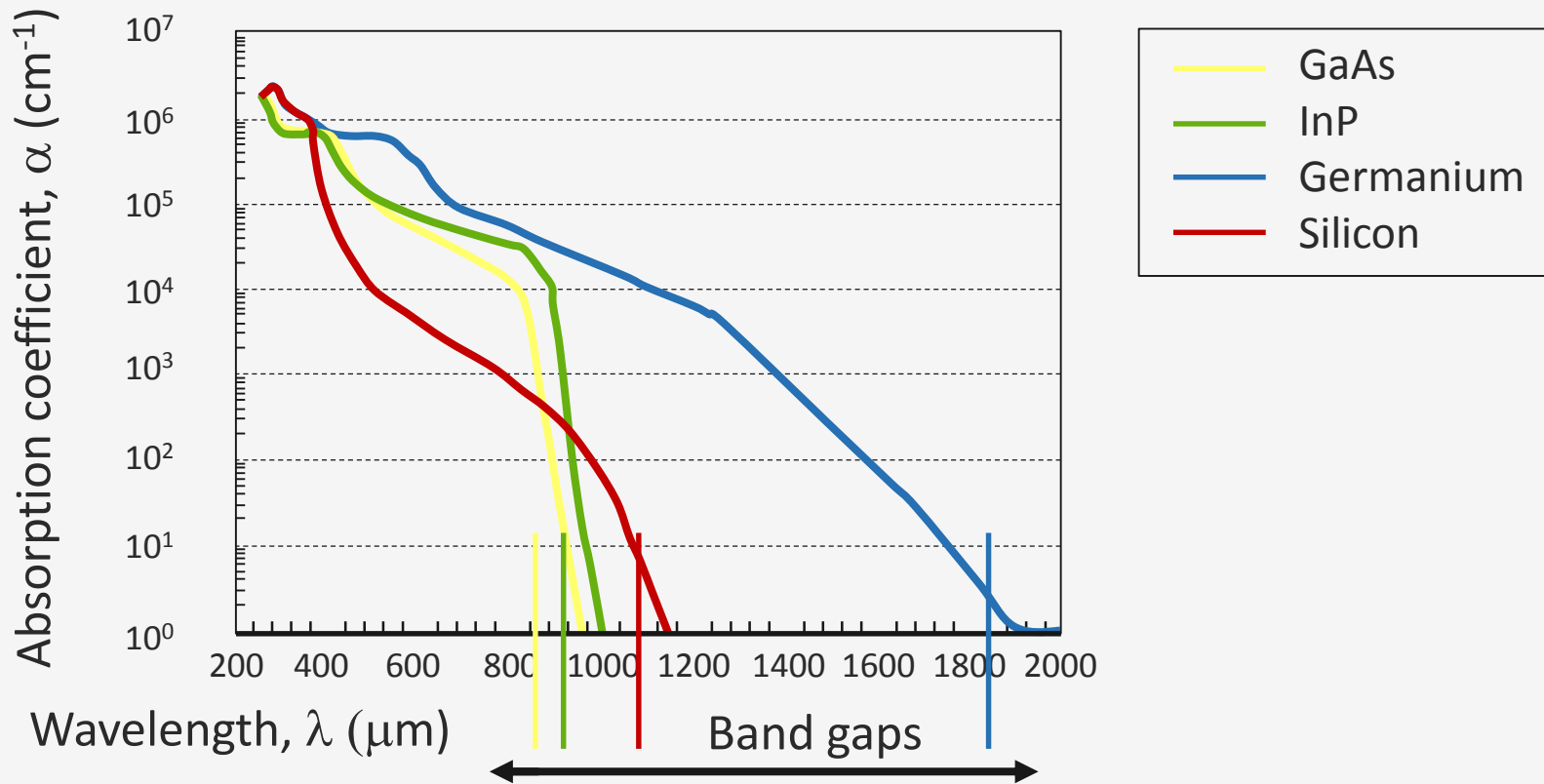
Light absorption: Lambert-Beer's law

$$\frac{\partial I(\nu, x)}{\partial x} = -\alpha(\nu)I(\nu, x)$$

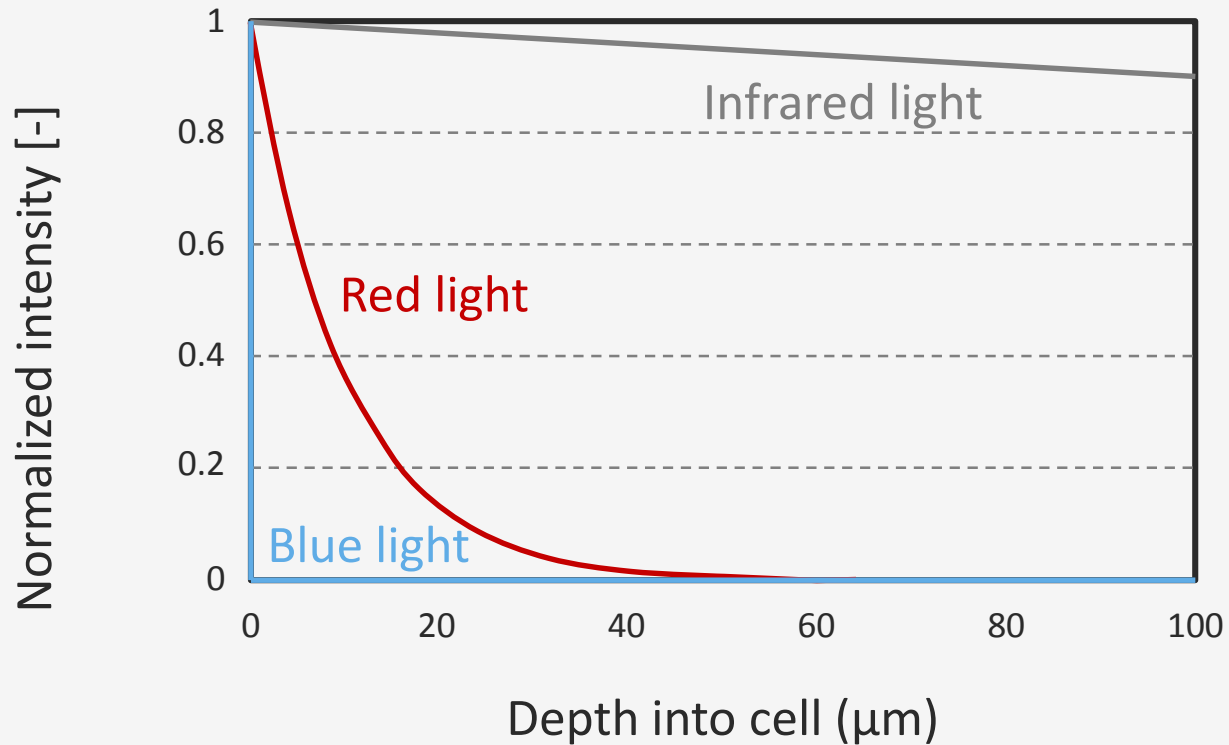
$$I(\nu, x) = I_0(\nu) \exp(-\alpha(\nu)x)$$

$\alpha(\nu)$ expressed in cm^{-1}

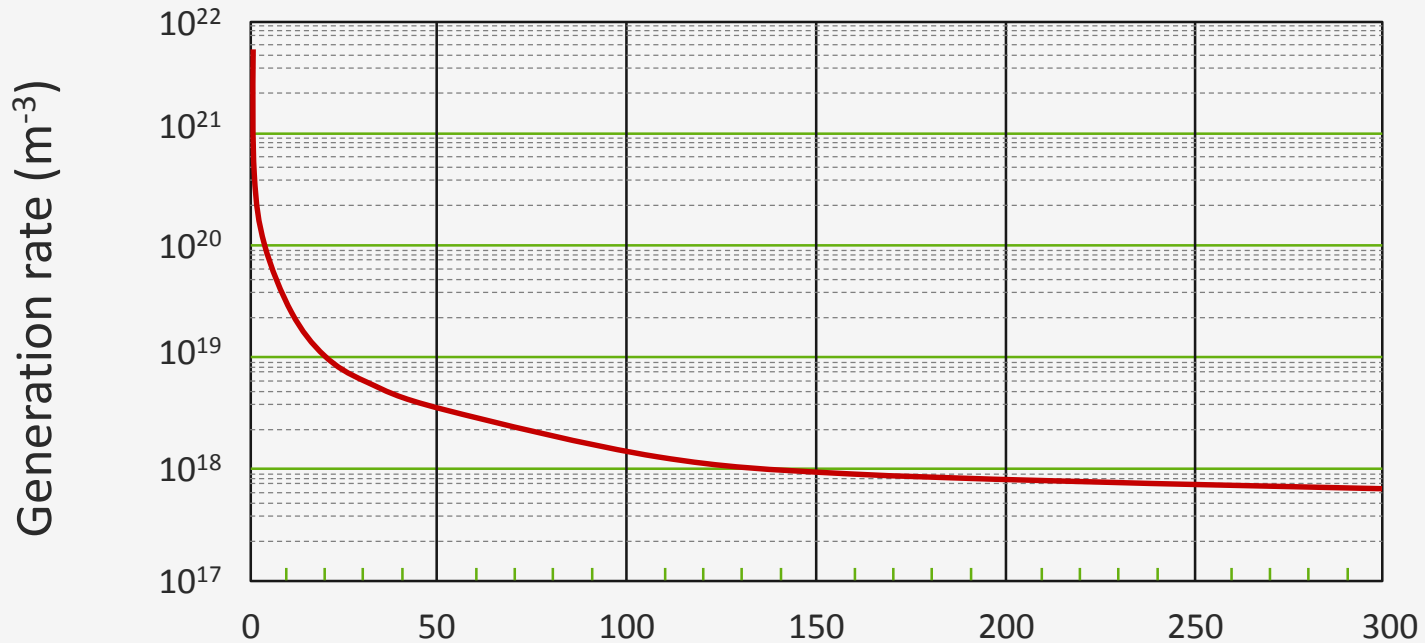
Absorption coefficient



Absorption coefficient



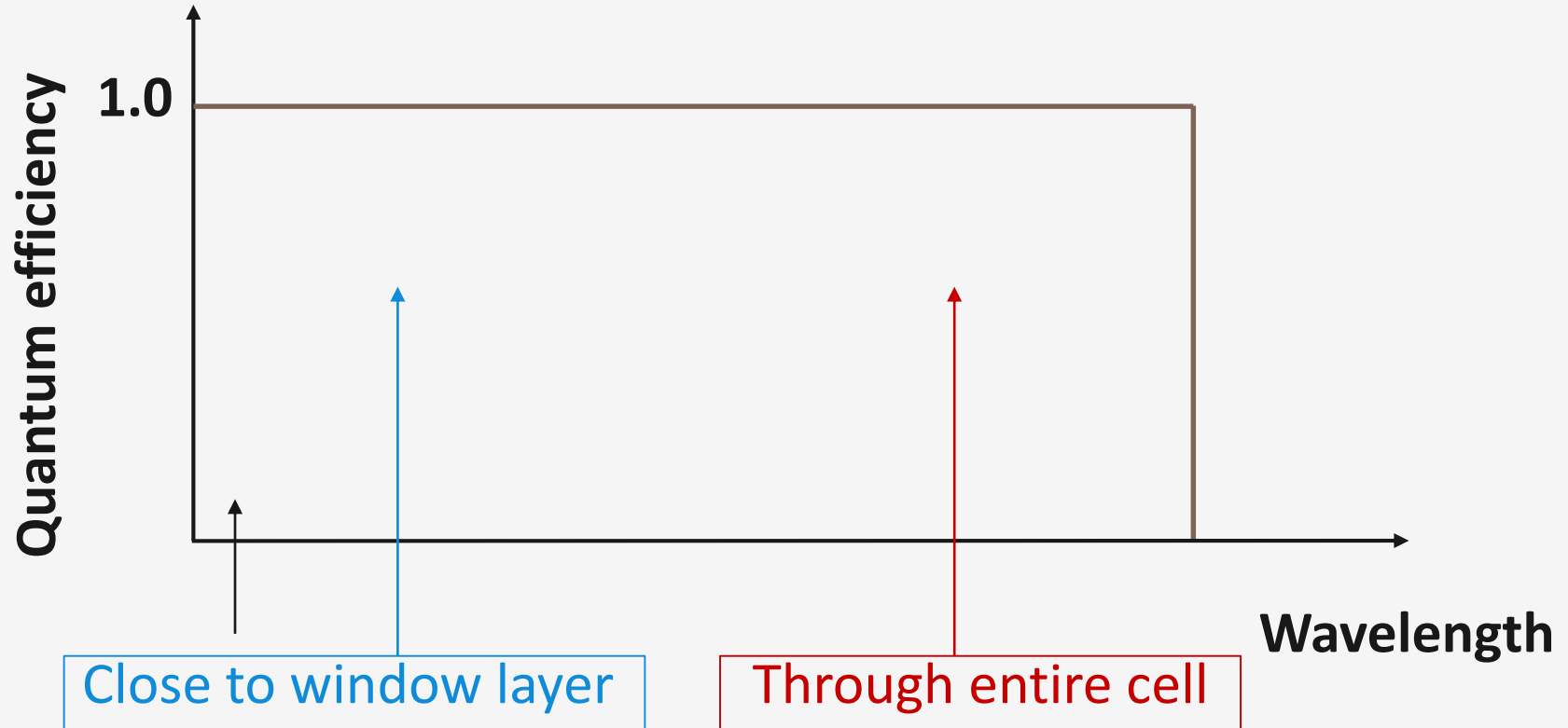
Absorption coefficient



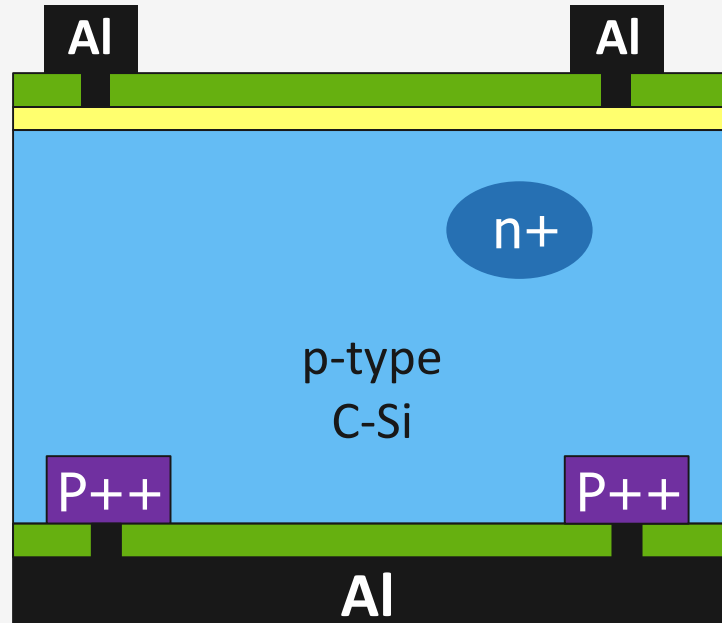
Top solar cell

Cell depth x (μm)

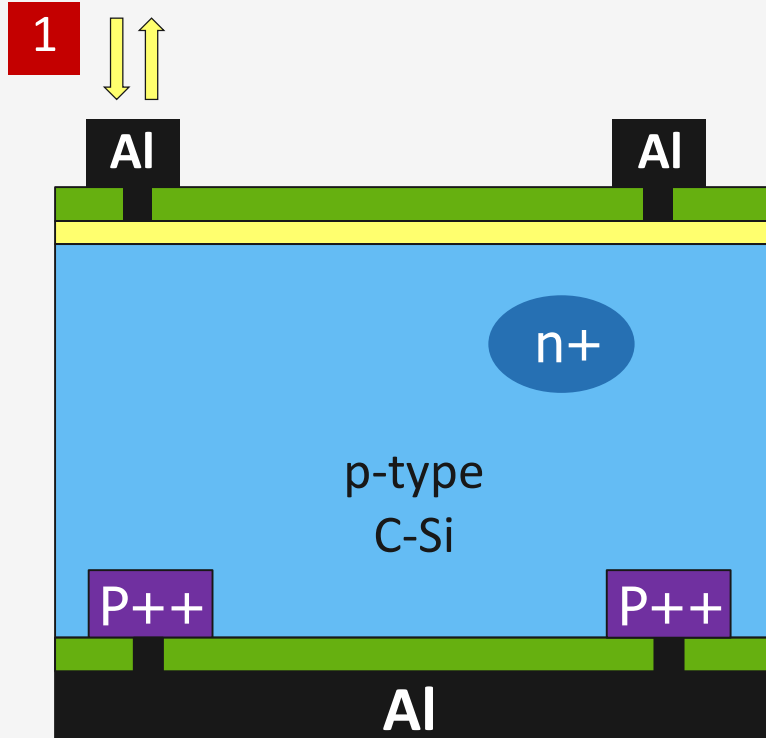
External quantum efficiency



Parasitic losses = out-side absorbing layers



Parasitic losses = out-side absorbing layers

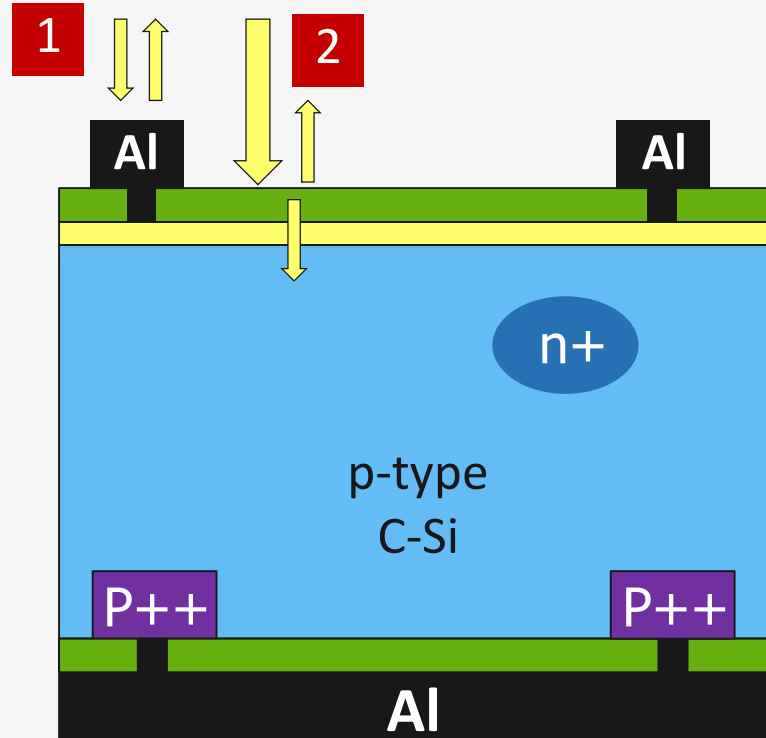


1 Shading

Parasitic losses = out-side absorbing layers

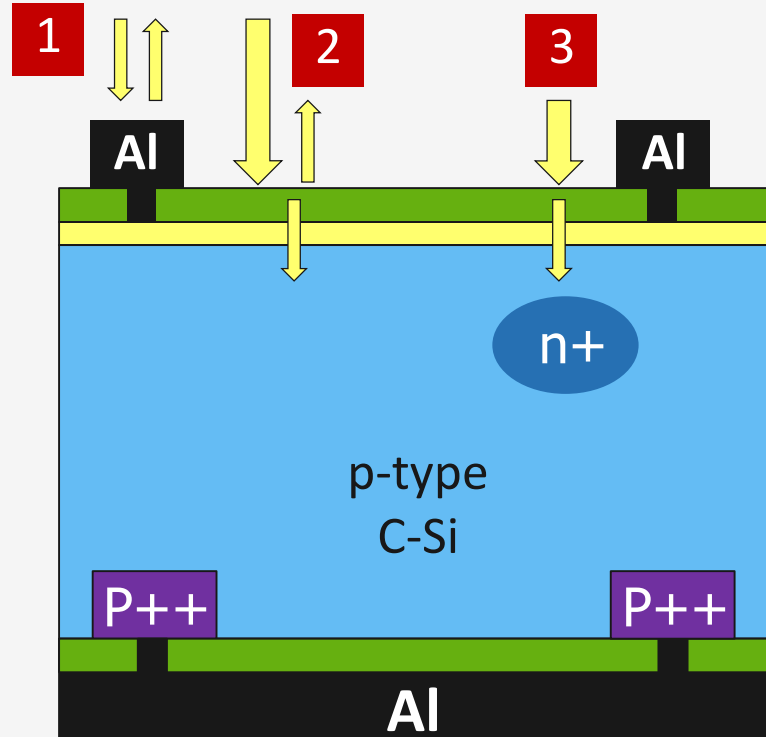
1 Shading

2 Reflection



Parasitic losses = out-side absorbing layers

- 1 Shading
- 2 Reflection
- 3 Parasitic absorption



Parasitic losses = out-side absorbing layers

- 1 Shading
- 2 Reflection
- 3 Parasitic absorption
- 4 Transmission

