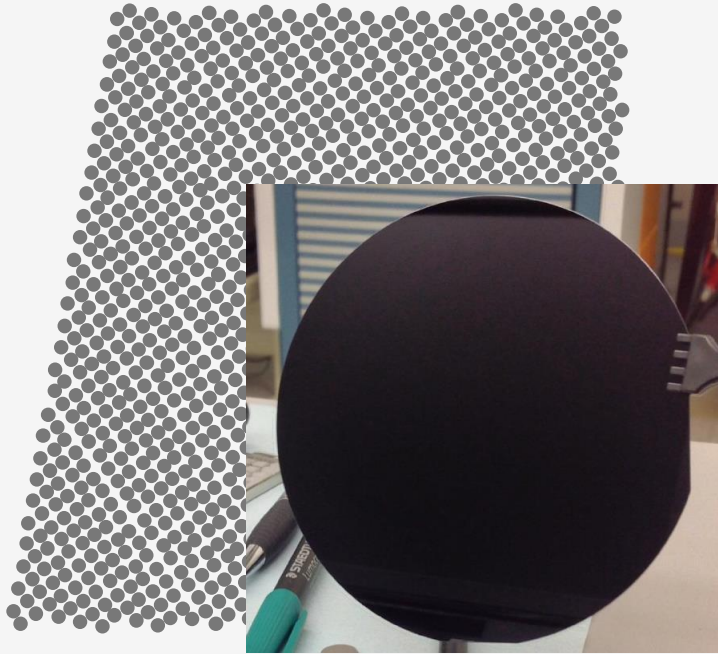


# PV Technology Based on Crystalline Silicon Wafers

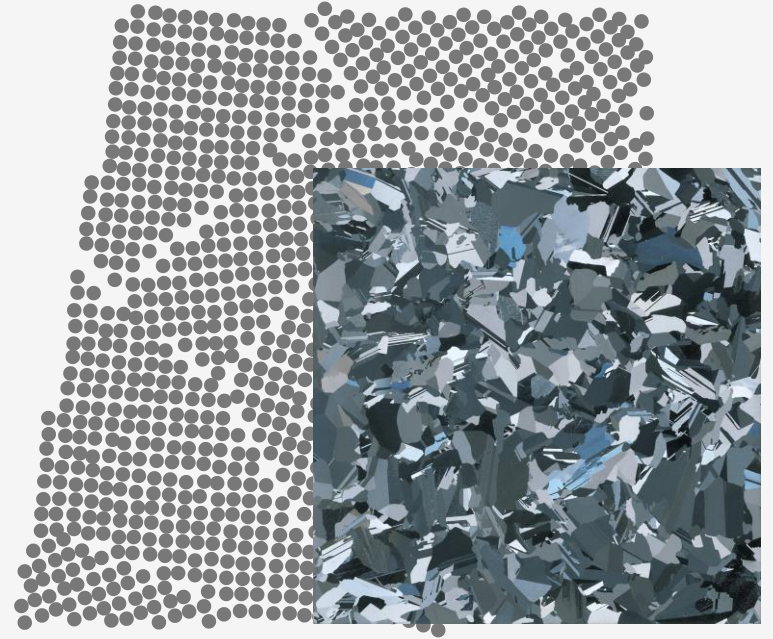
## High-Efficiency Concepts of c-Si Wafer Based Solar Cells

*Week 4.4*

Arno Smets

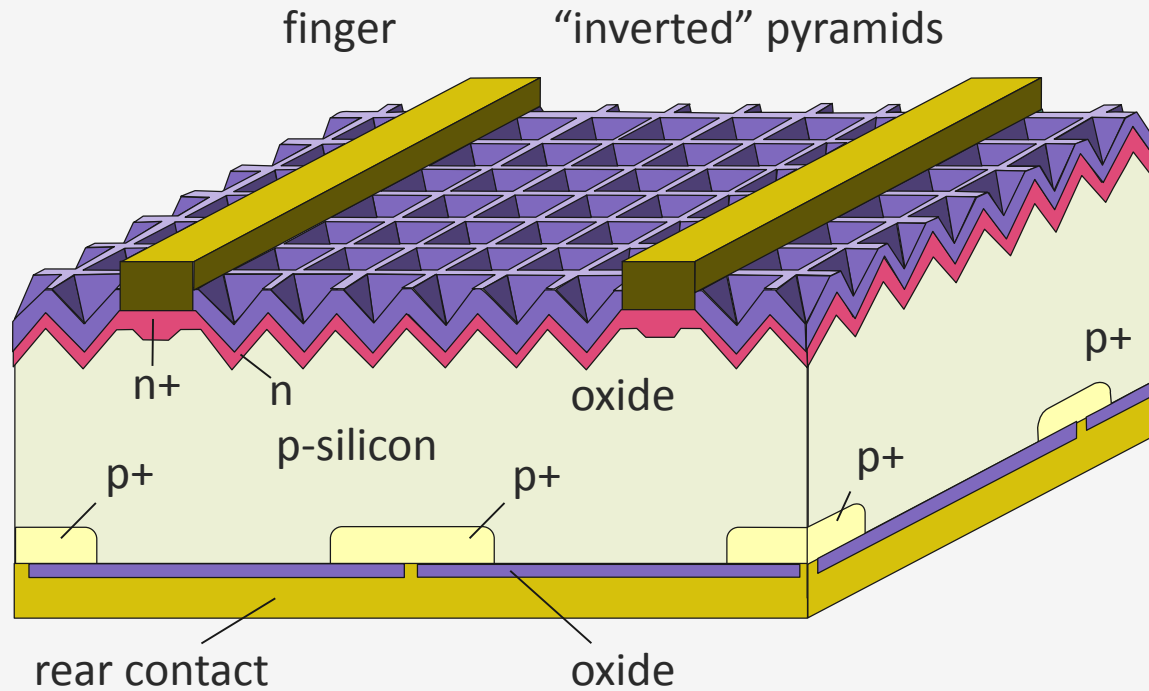


Monocrystalline

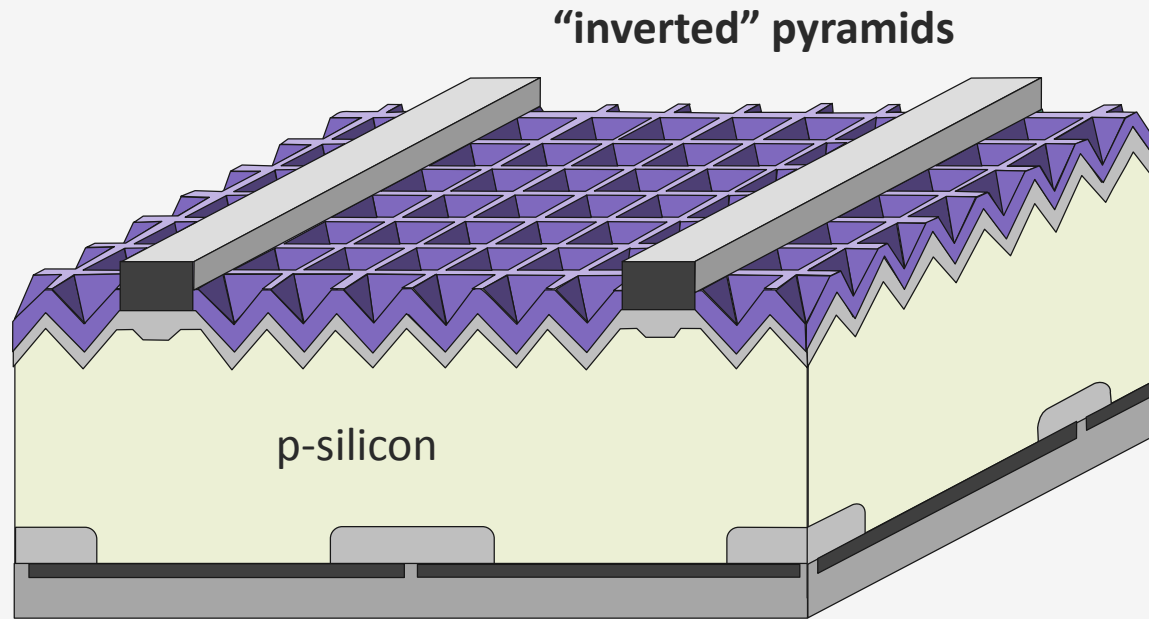


Multicrystalline

# Losses in charge collection and separation

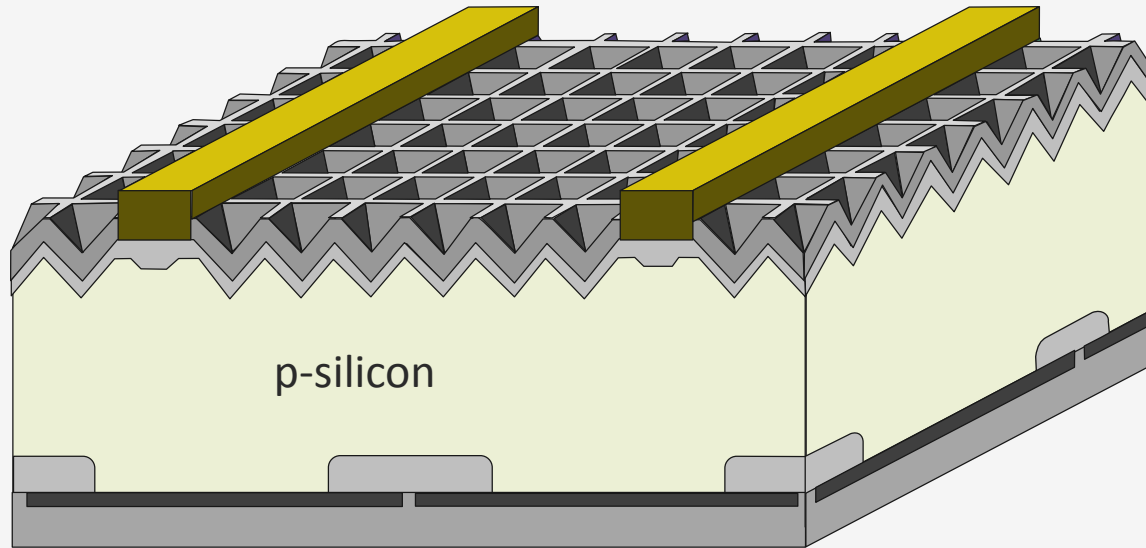


# PERL solar cell

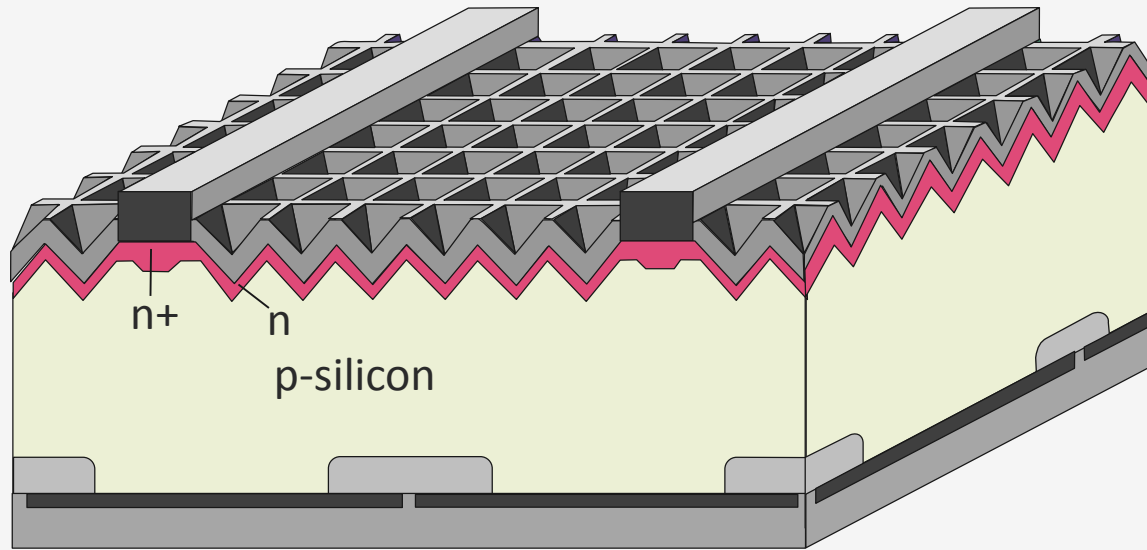


# PERL solar cell

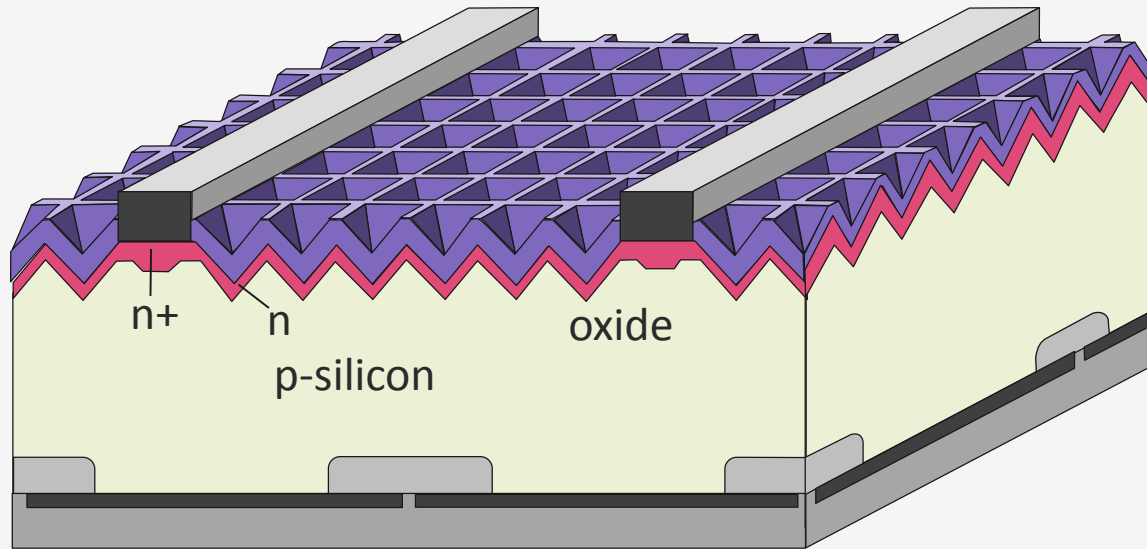
“inverted” pyramids



# PERL solar cell

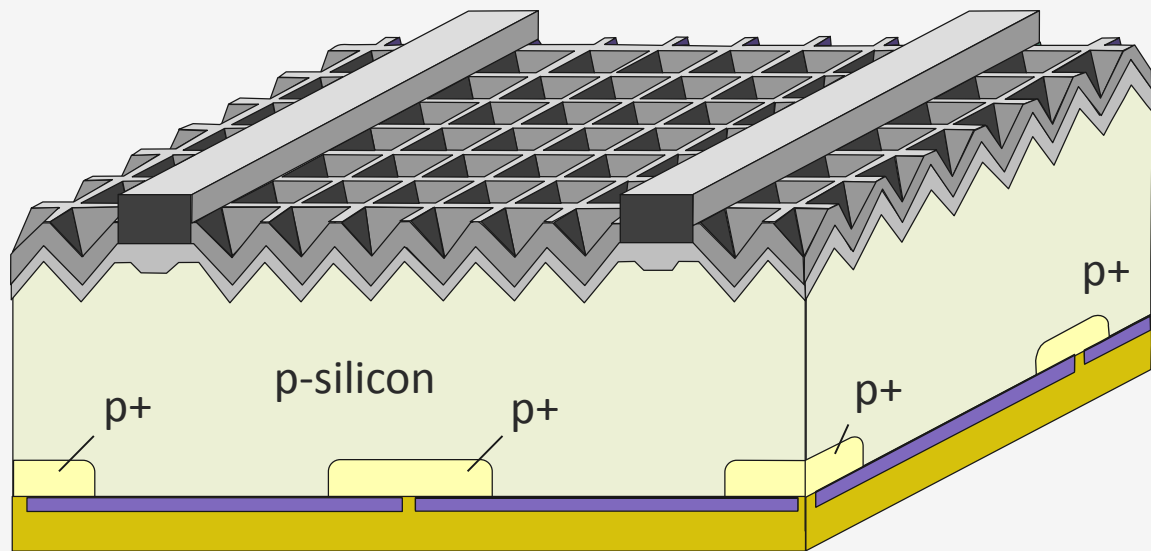


# PERL solar cell



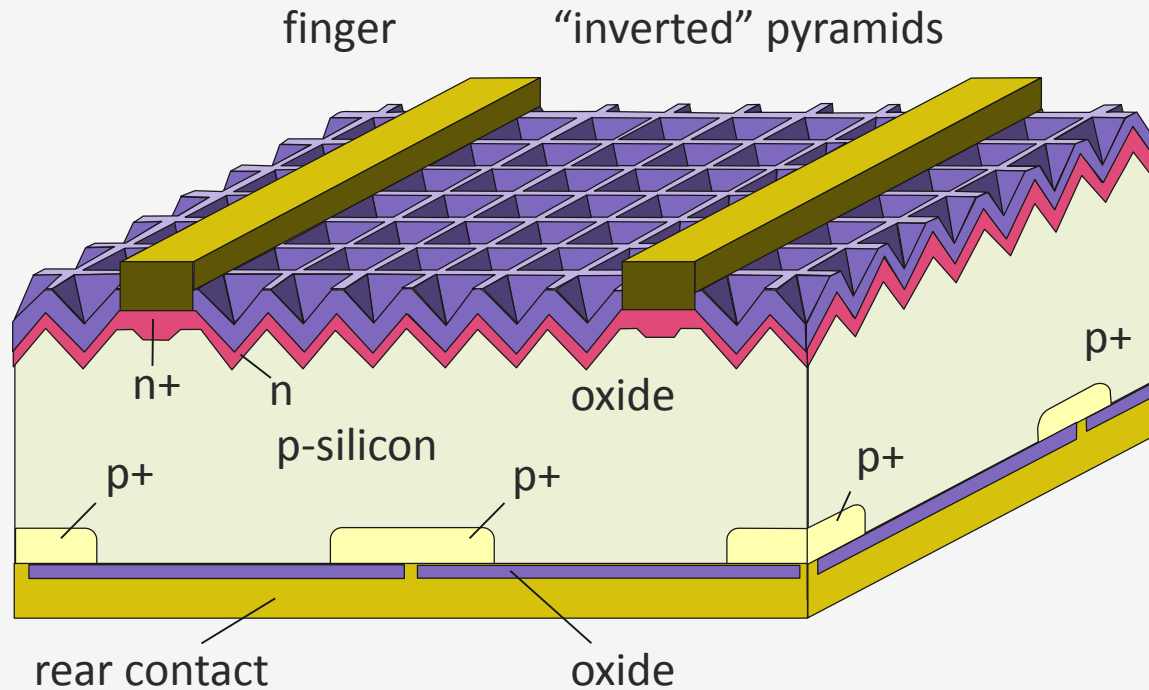
# PERL solar cell

“inverted” pyramids

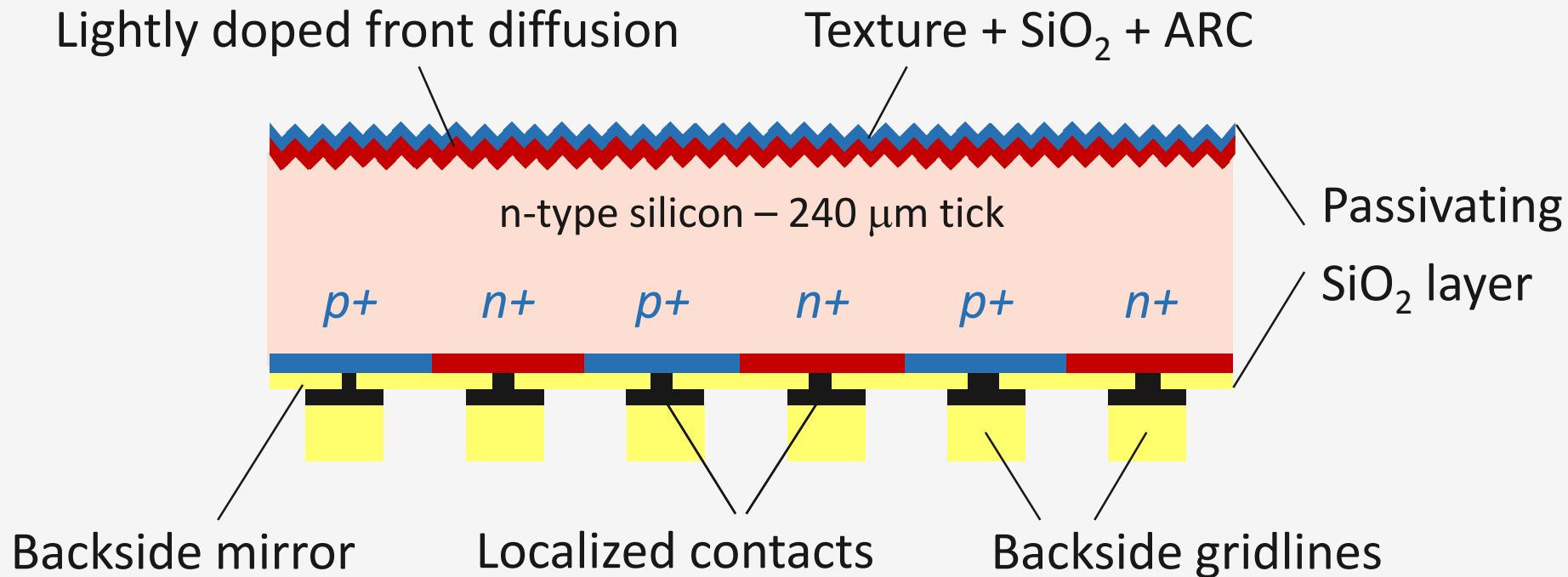




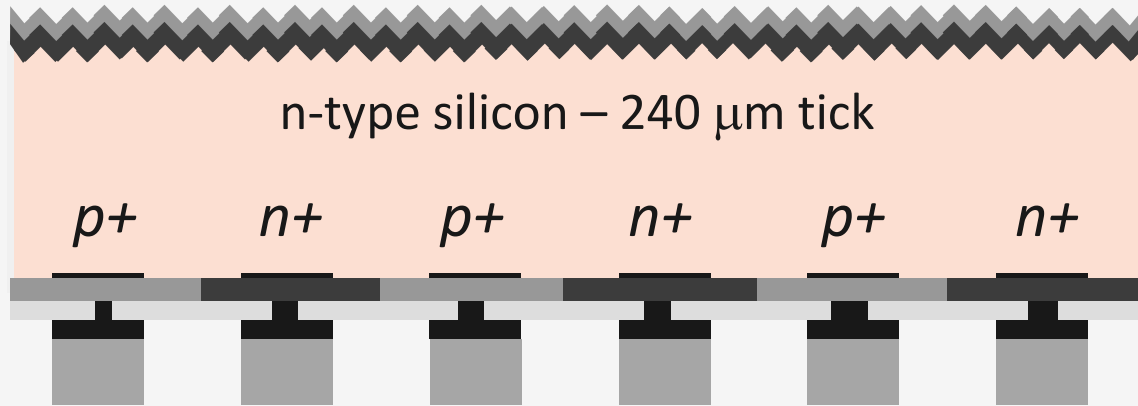
# Losses in charge collection and separation



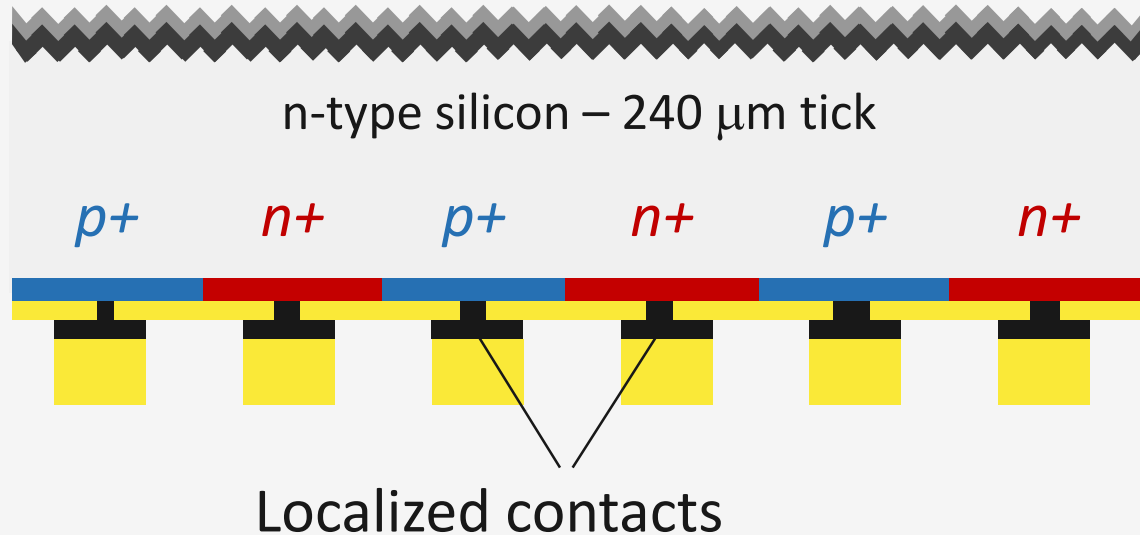
# Losses in charge collection and separation



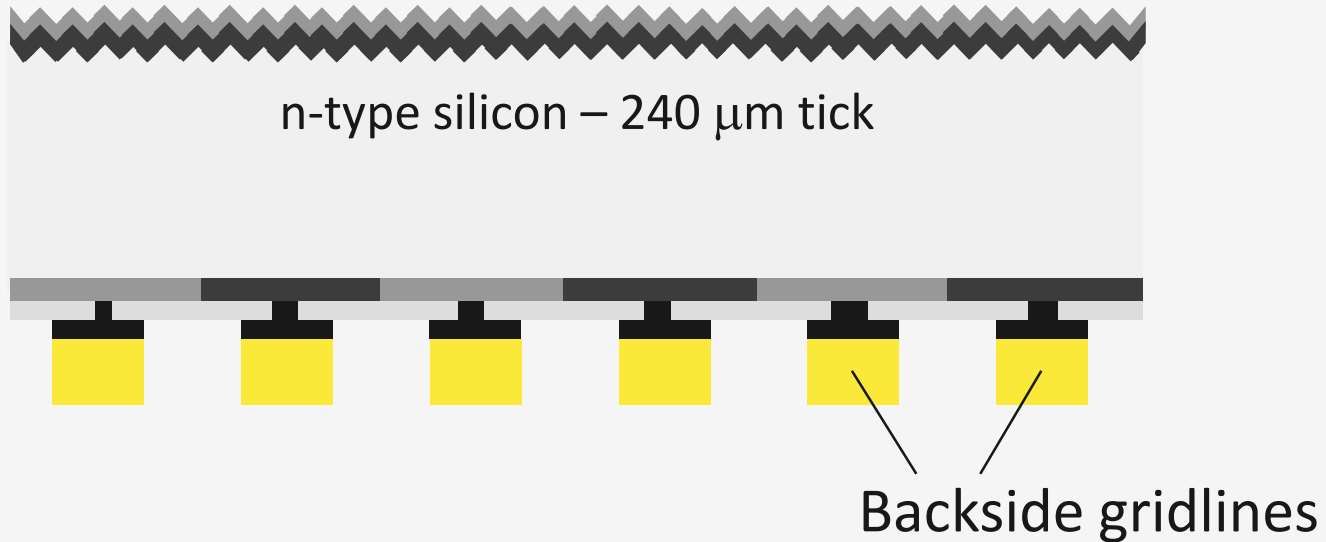
# Losses in charge collection and separation



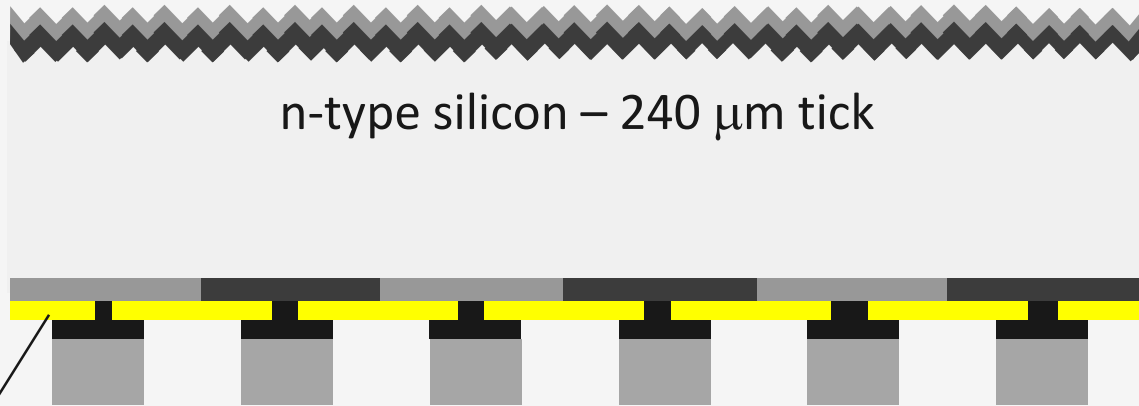
# Losses in charge collection and separation



# Losses in charge collection and separation

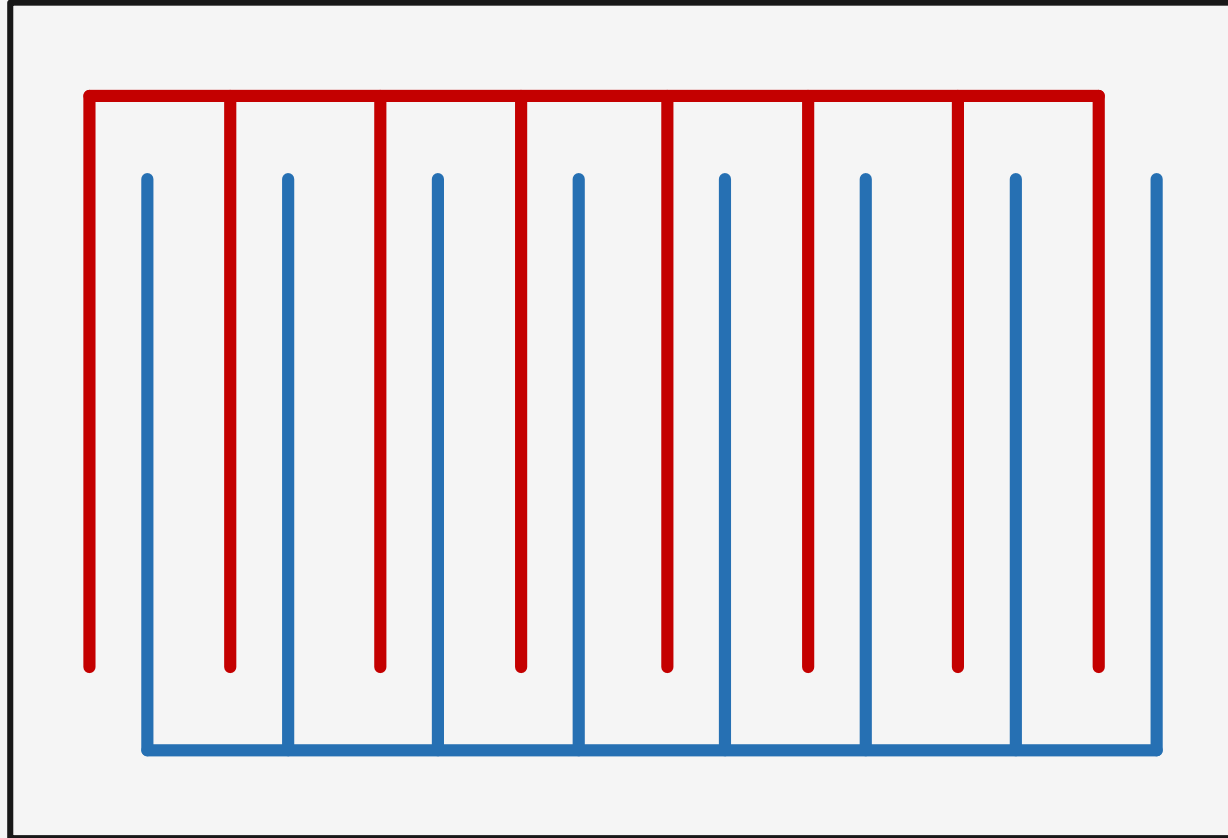


# Losses in charge collection and separation

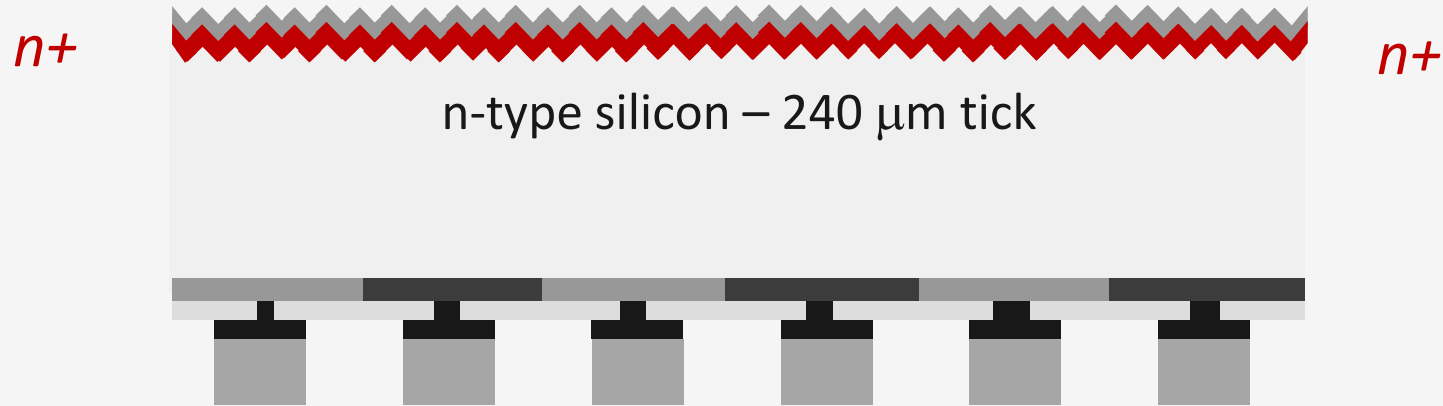


Backside mirror

# Interdigitated back contact grid



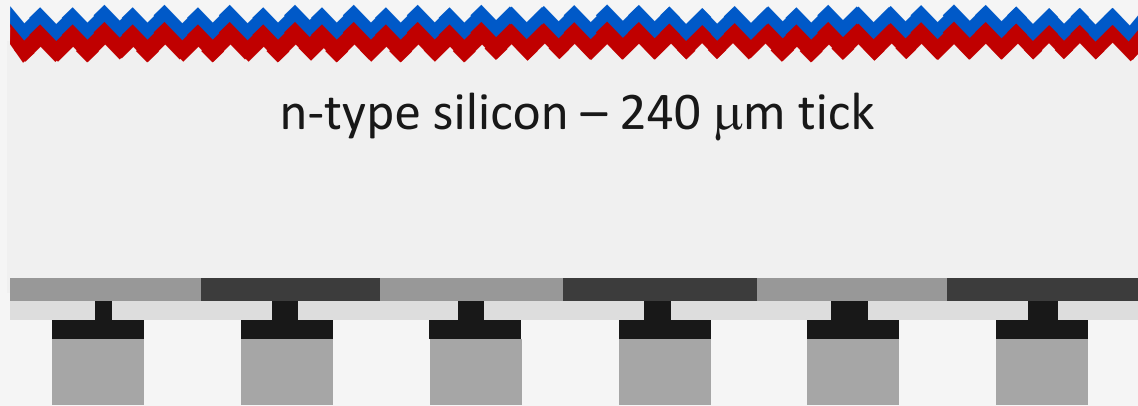
# Losses in charge collection and separation



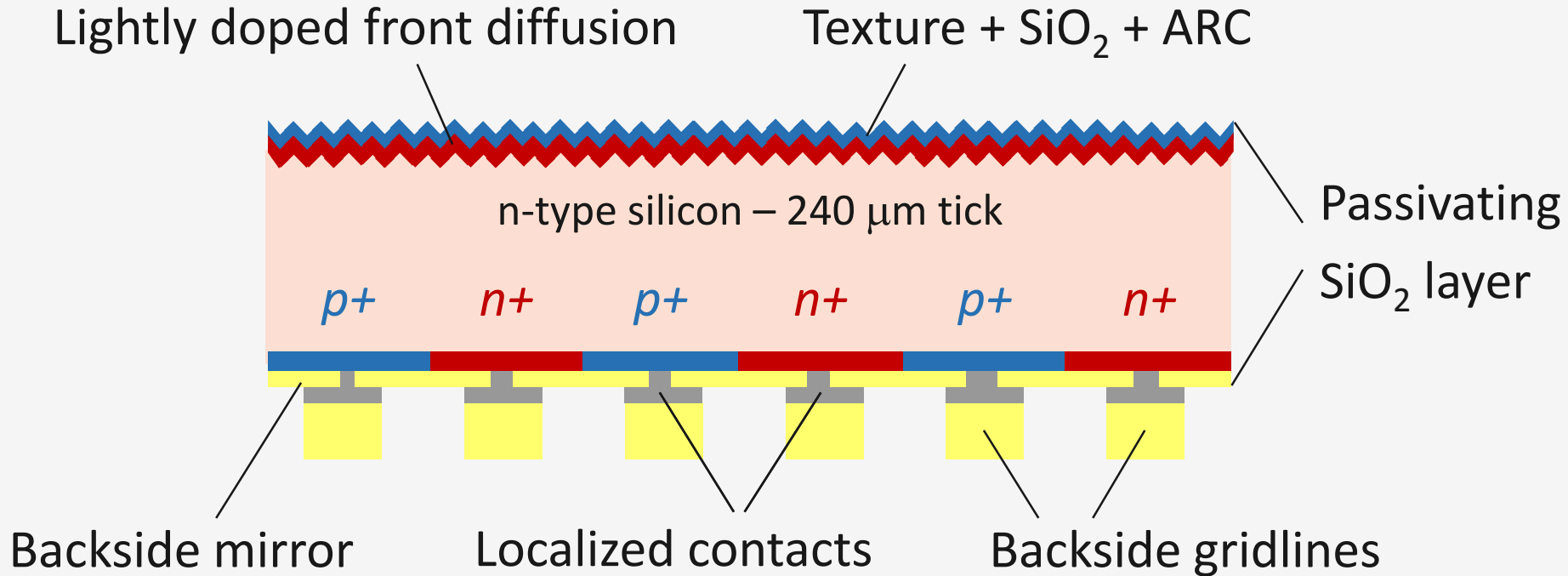


# Losses in charge collection and separation

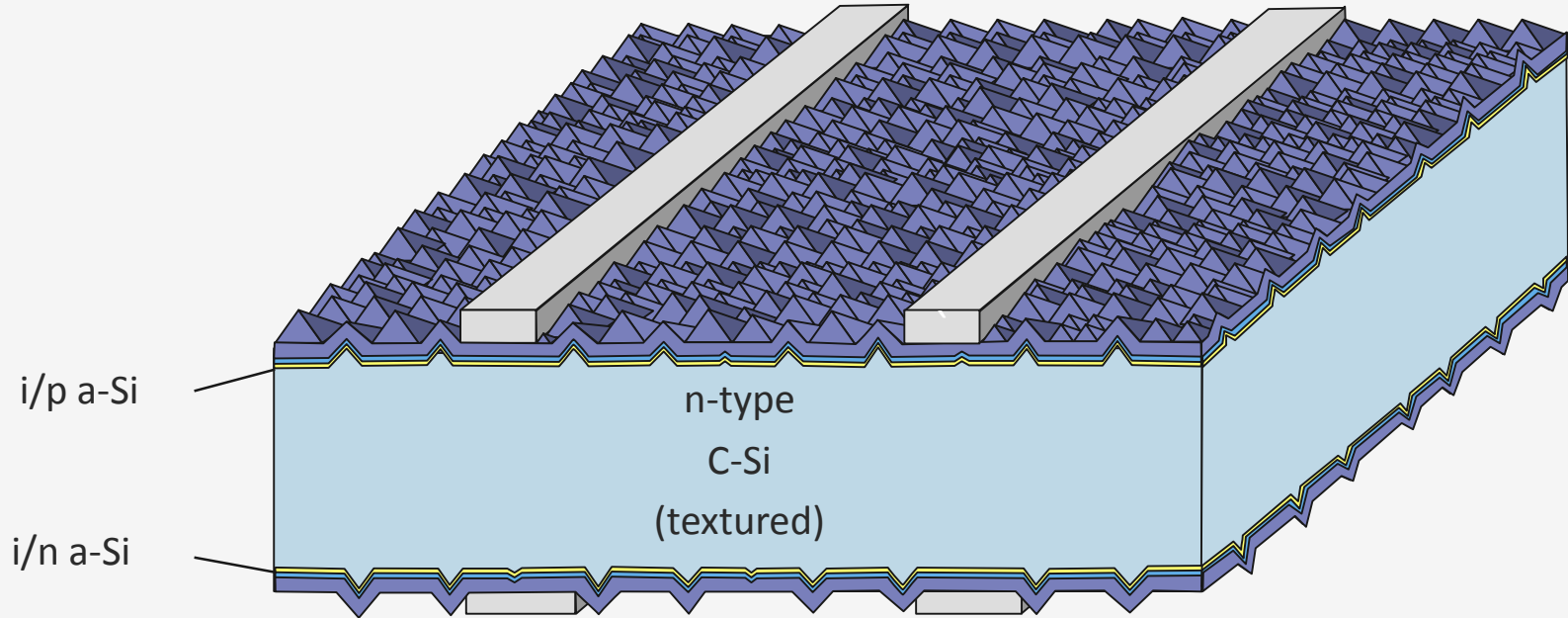
*Passivation + antireflection coating*



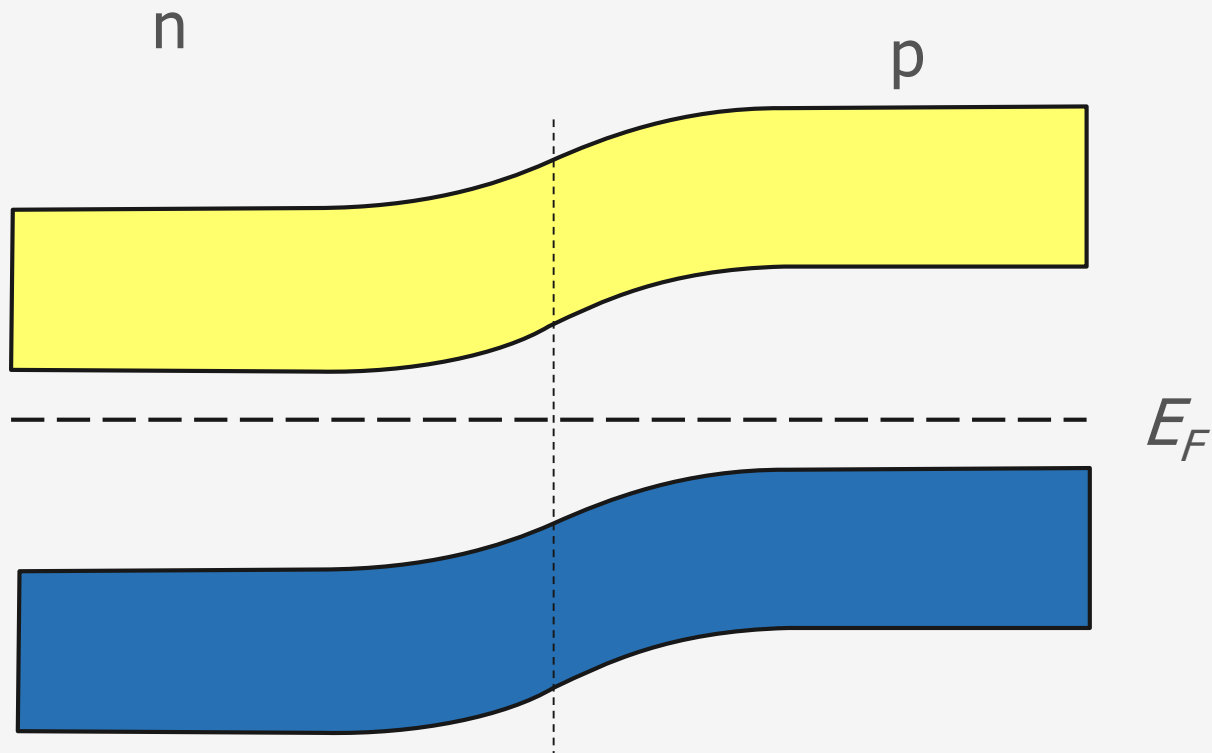
# Losses in charge collection and separation



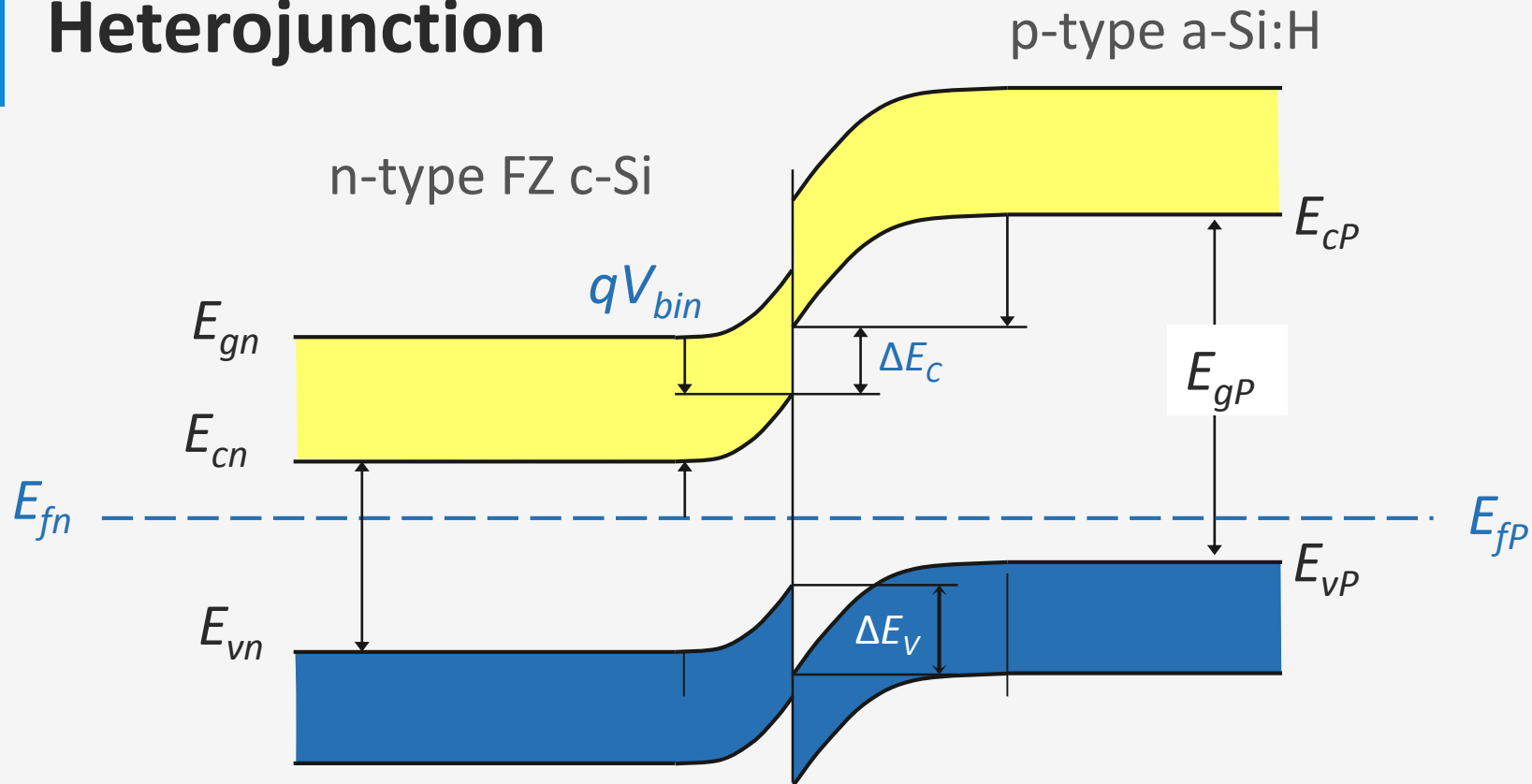
# C-Si wafer based hetero-junction solar cell



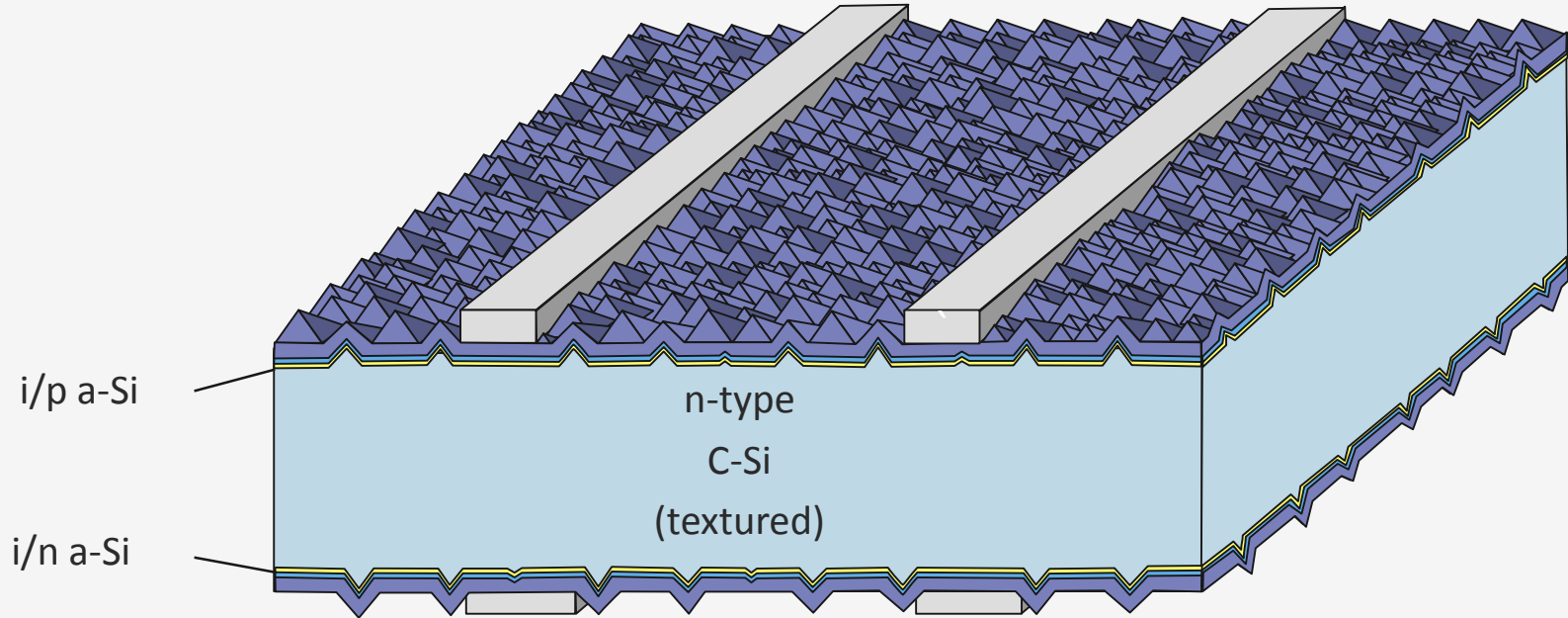
# Homojunction



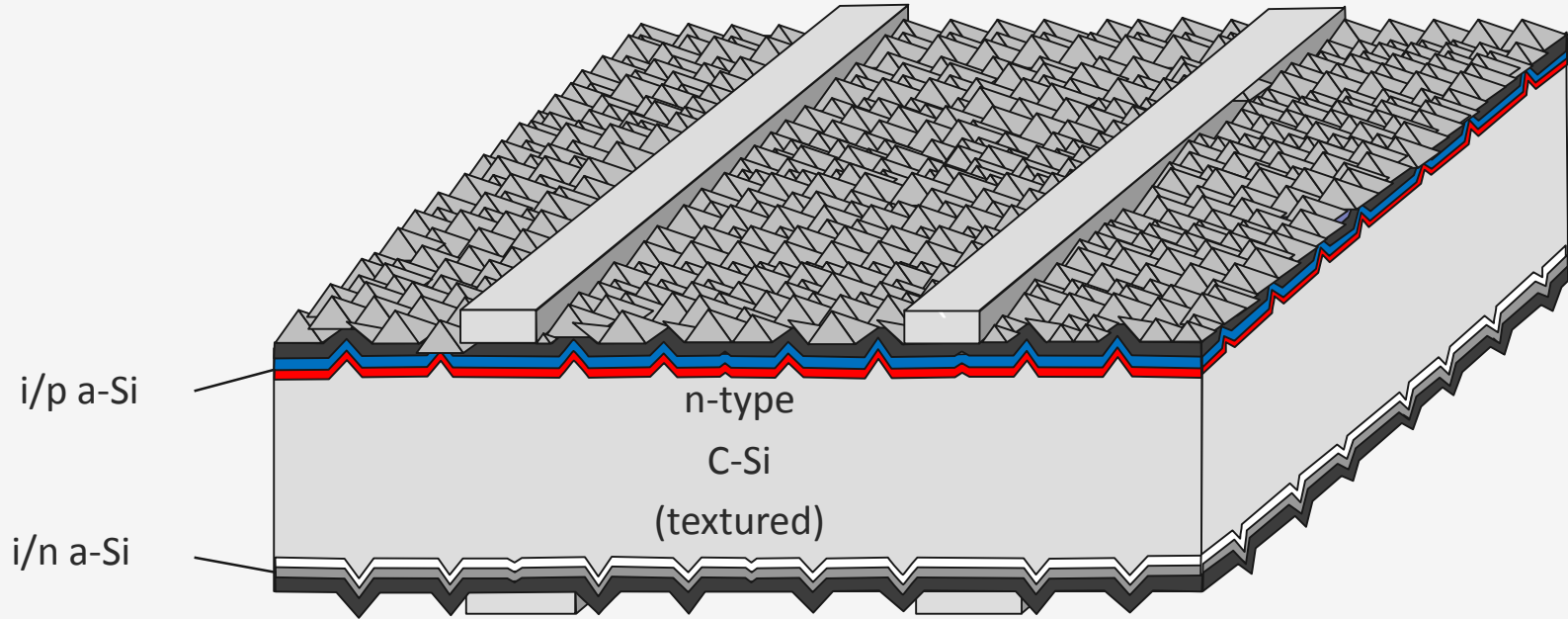
# Heterojunction



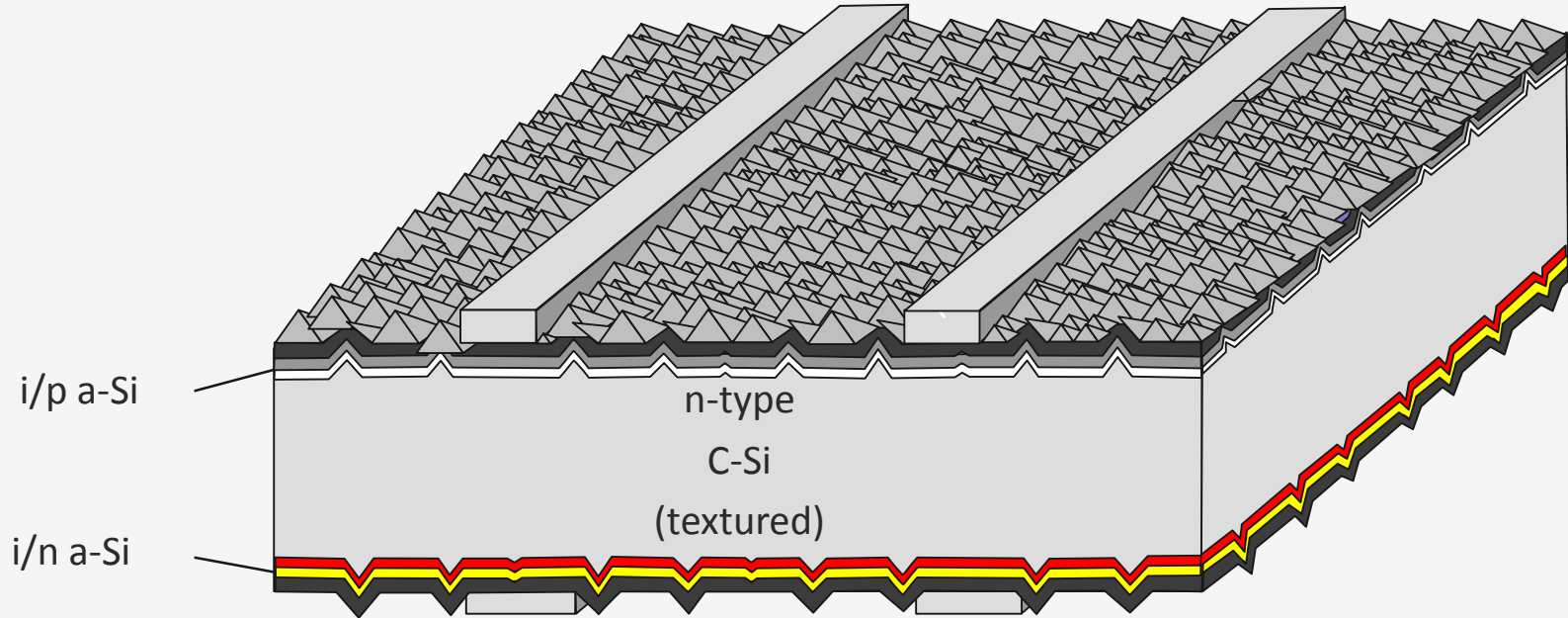
# C-Si wafer based hetero-junction solar cell



# C-Si wafer based hetero-junction solar cell

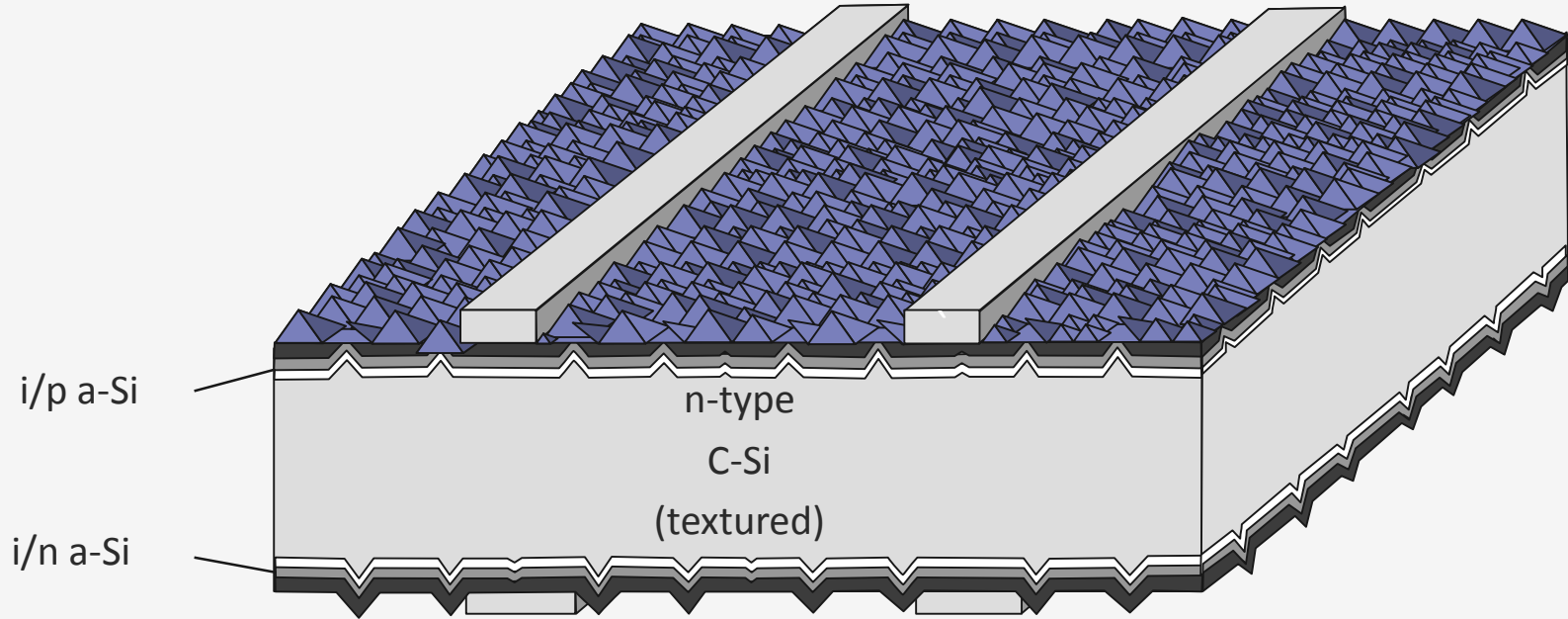


# C-Si wafer based hetero-junction solar cell

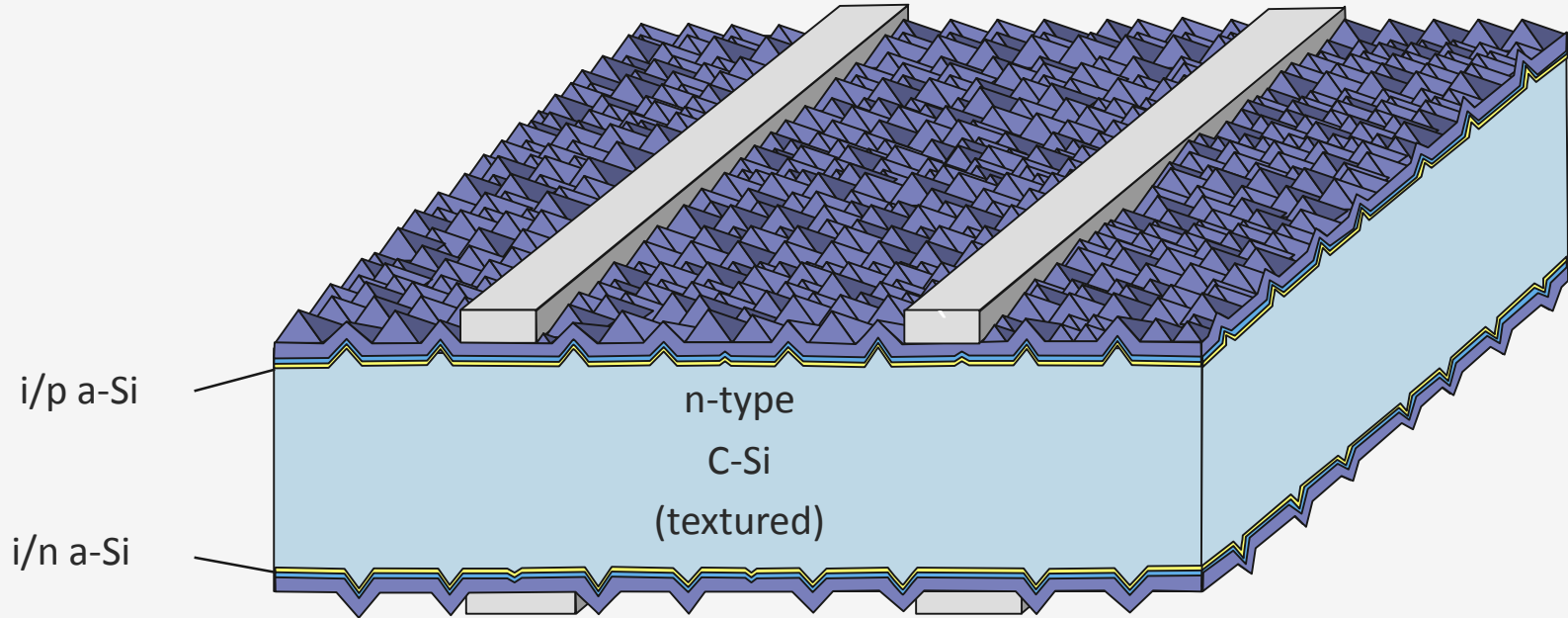




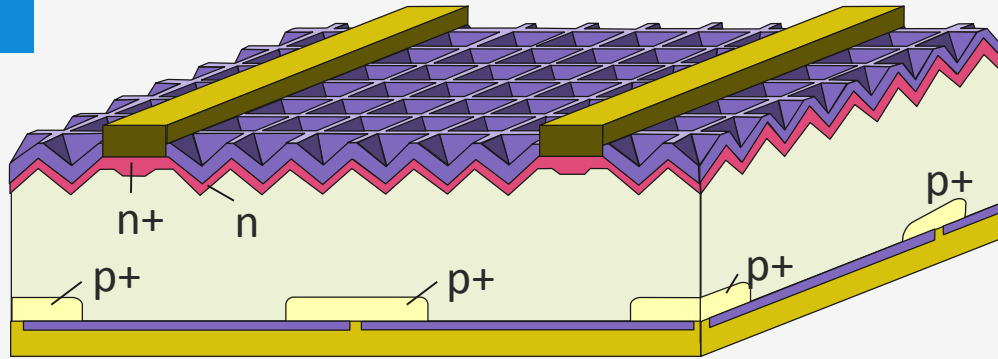
# C-Si wafer based hetero-junction solar cell



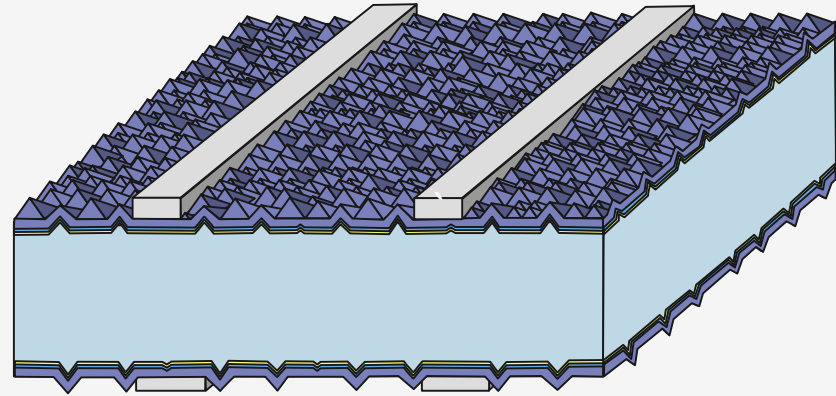
# C-Si wafer based hetero-junction solar cell



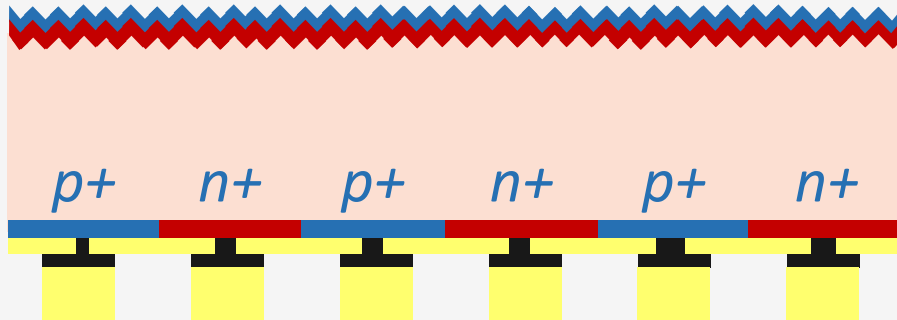
# Novel concepts



$\eta = 25\%$ ; Area = 4 cm<sup>2</sup>



$\eta = 24.7\%$ ; Area = 102 cm<sup>2</sup>



$\eta = 24.2\%$ ; Area = 155 cm<sup>2</sup>

**Thank you for your attention!**