

SOLAR ENERGY

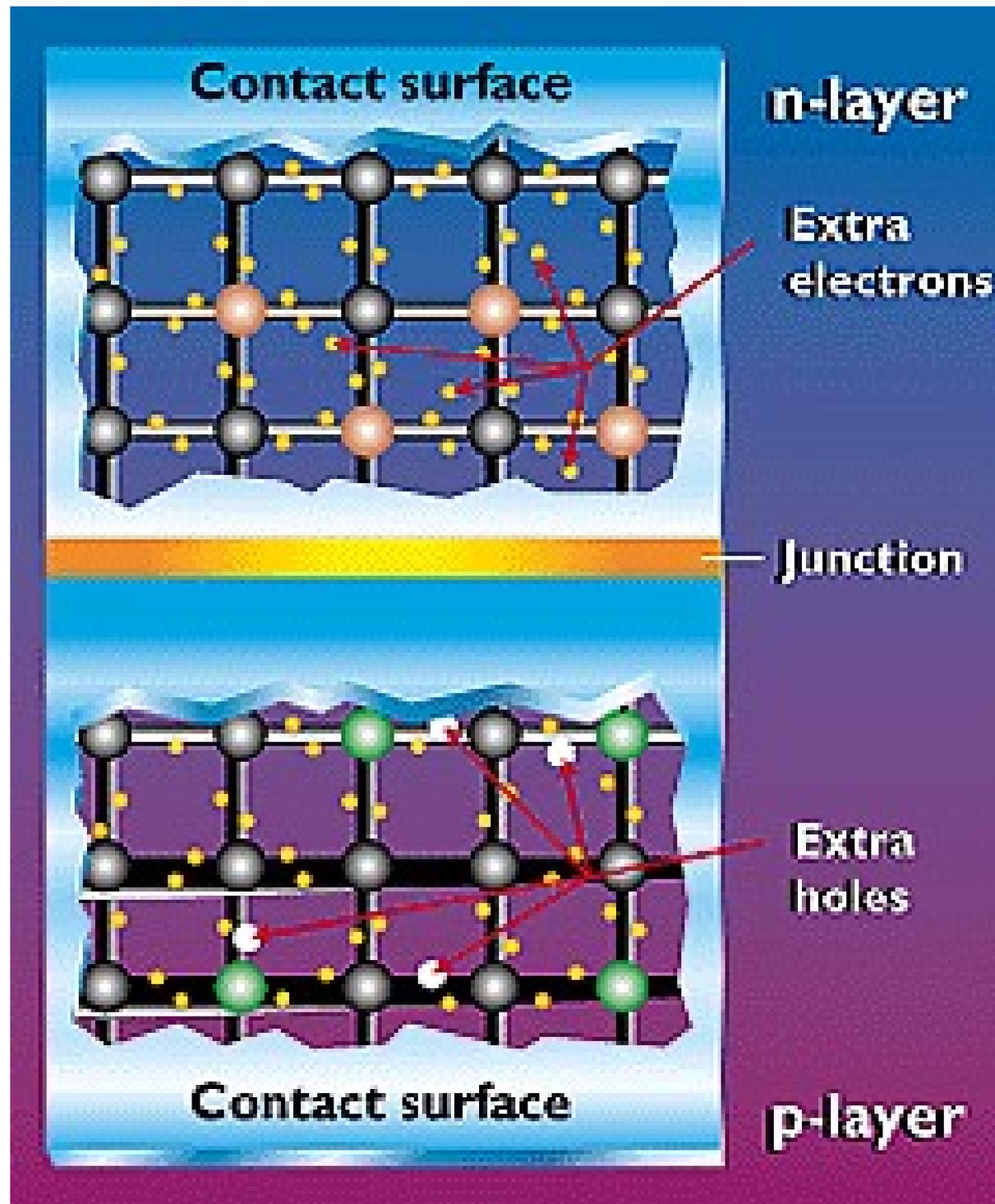
What is Photovoltaics?

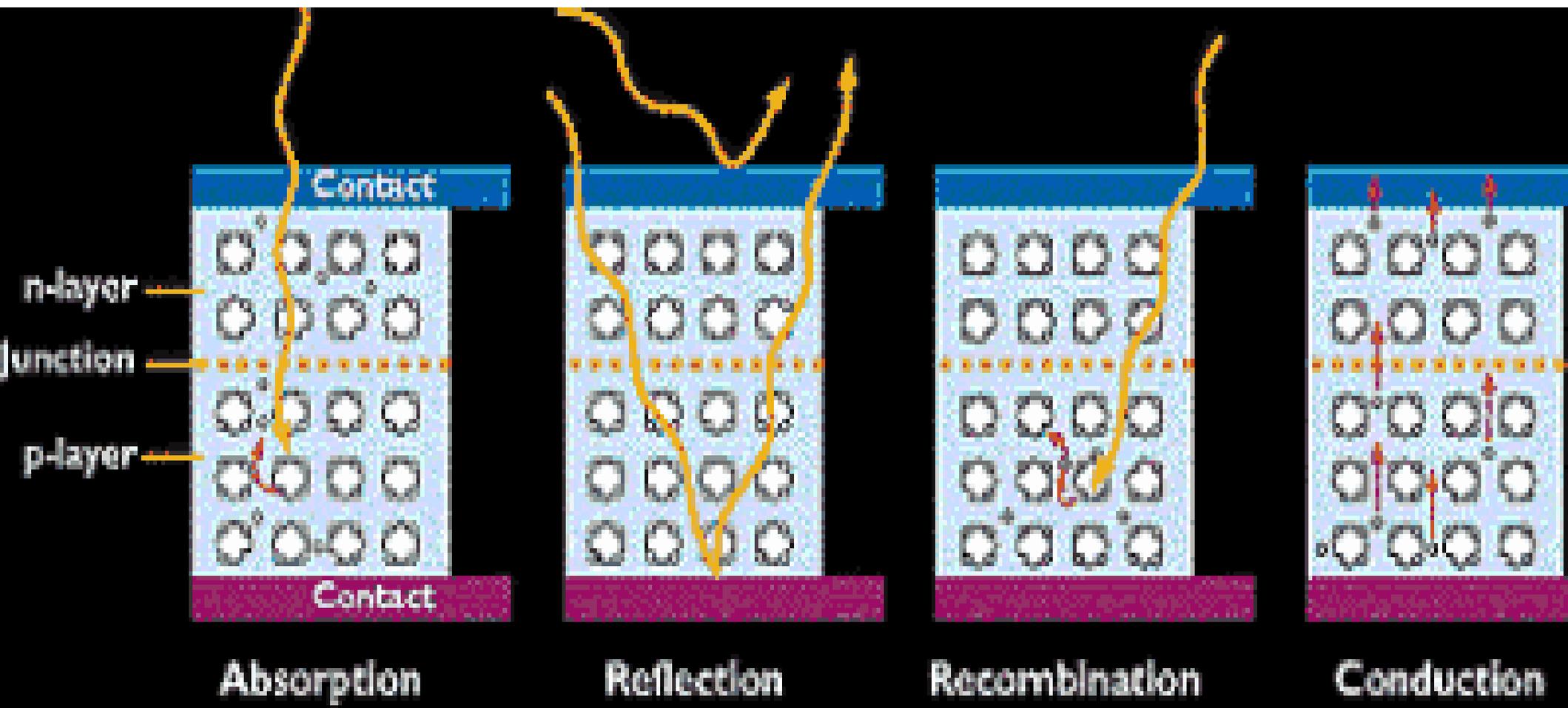


How a Photovoltaic cell works

-

-





INSIDE A PHOTOVOLTAIC CELL

Electrical Transmission System

Energy from Light

Solar Arrays

Transparent negative terminal

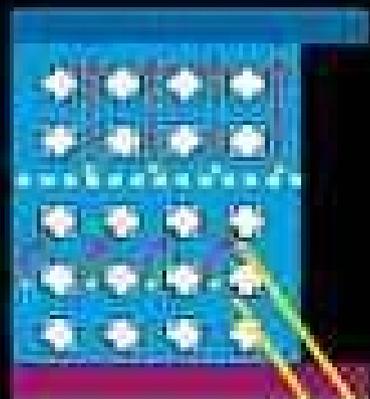
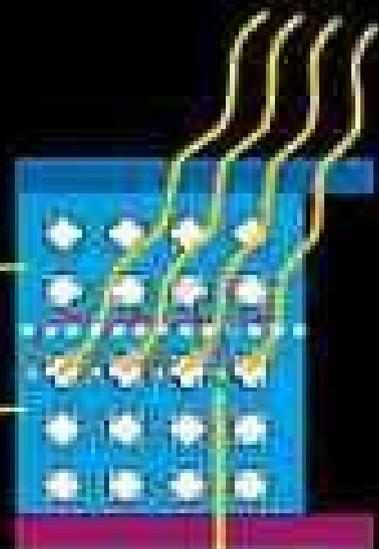
Glass

n-type layer (semiconductor)

Junction

p-type layer (semiconductor)

Positive terminal



Fabrication of Solar Cell Material

- Sensitive to the color of the sunlight.
- Some materials are better absorbers.
- Band gap of the semiconductor material.

Materials/Technology Used

Ø

Ø

Ø

Ø

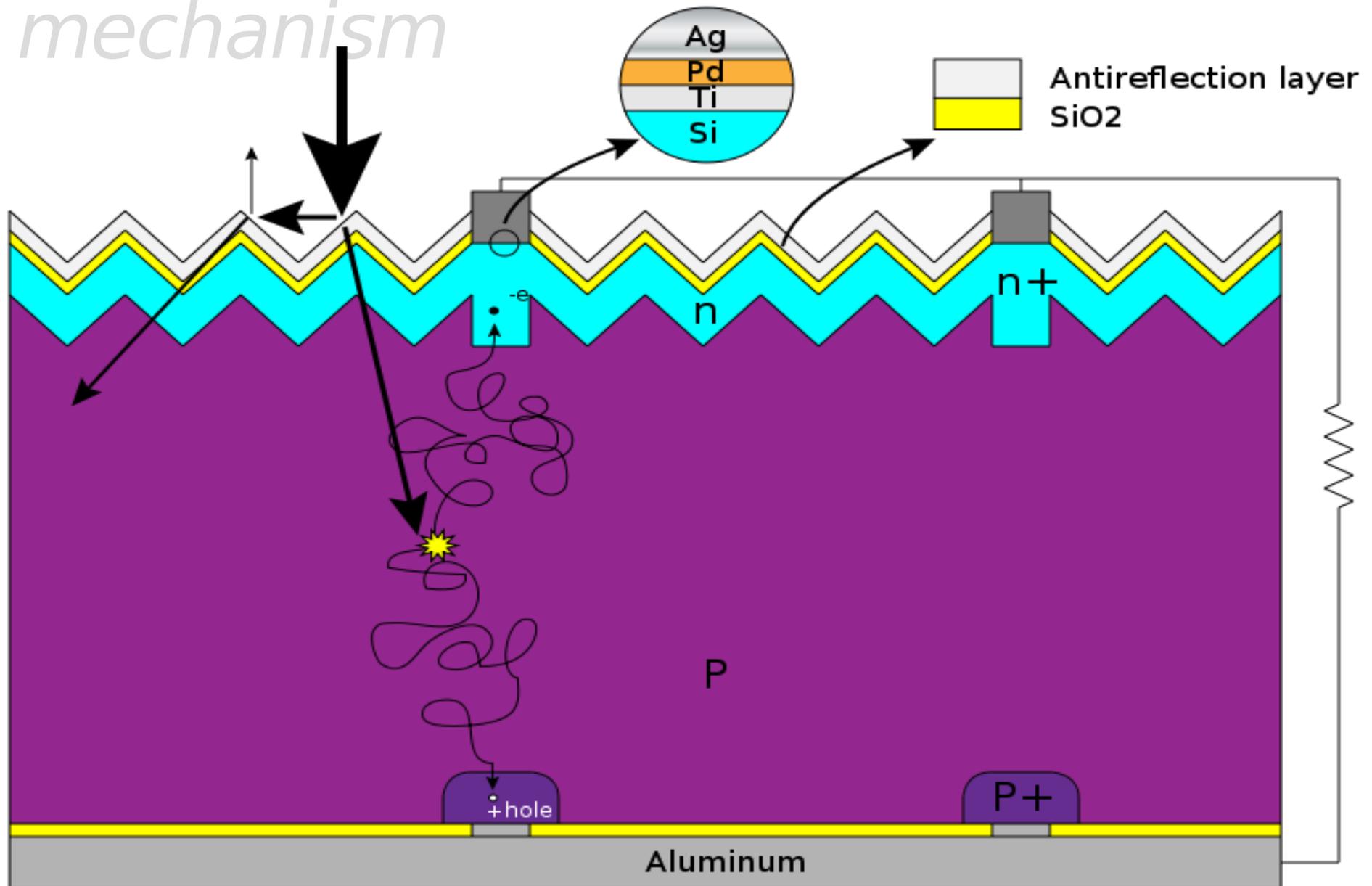
Ø

Ø

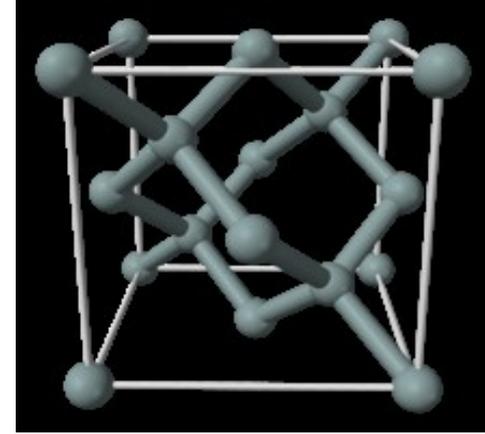
Ø

Ø

Basic structure of a silicon based solar cell and its working mechanism



MonoCrystalline Silicon



□

□

□

■



Polycrystalline Silicon



■

■

Ribbon silicon

□

▪

▪

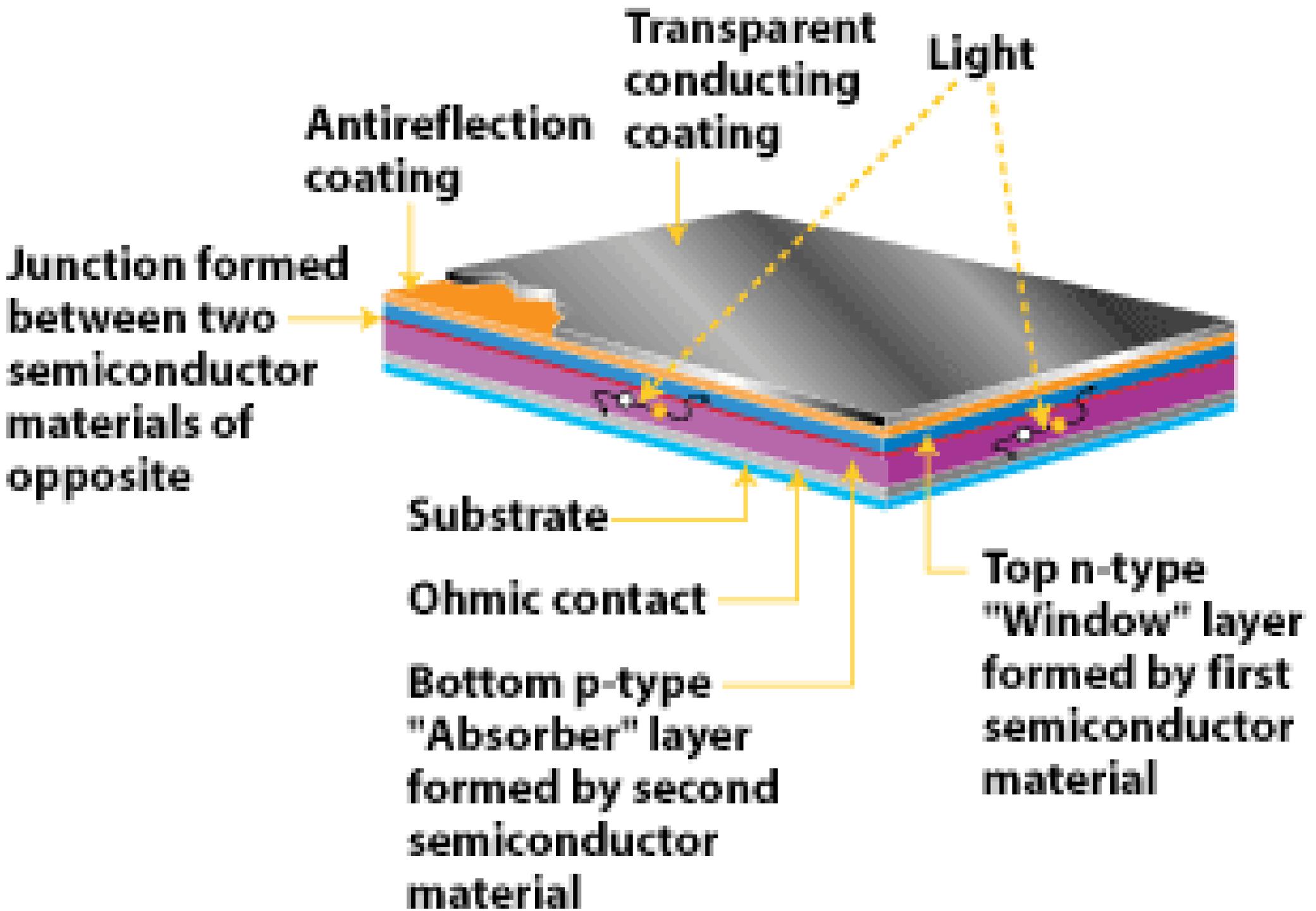
Thin film solar cell

□

■

■

■



Thin Film Silicon

■

■

■

■

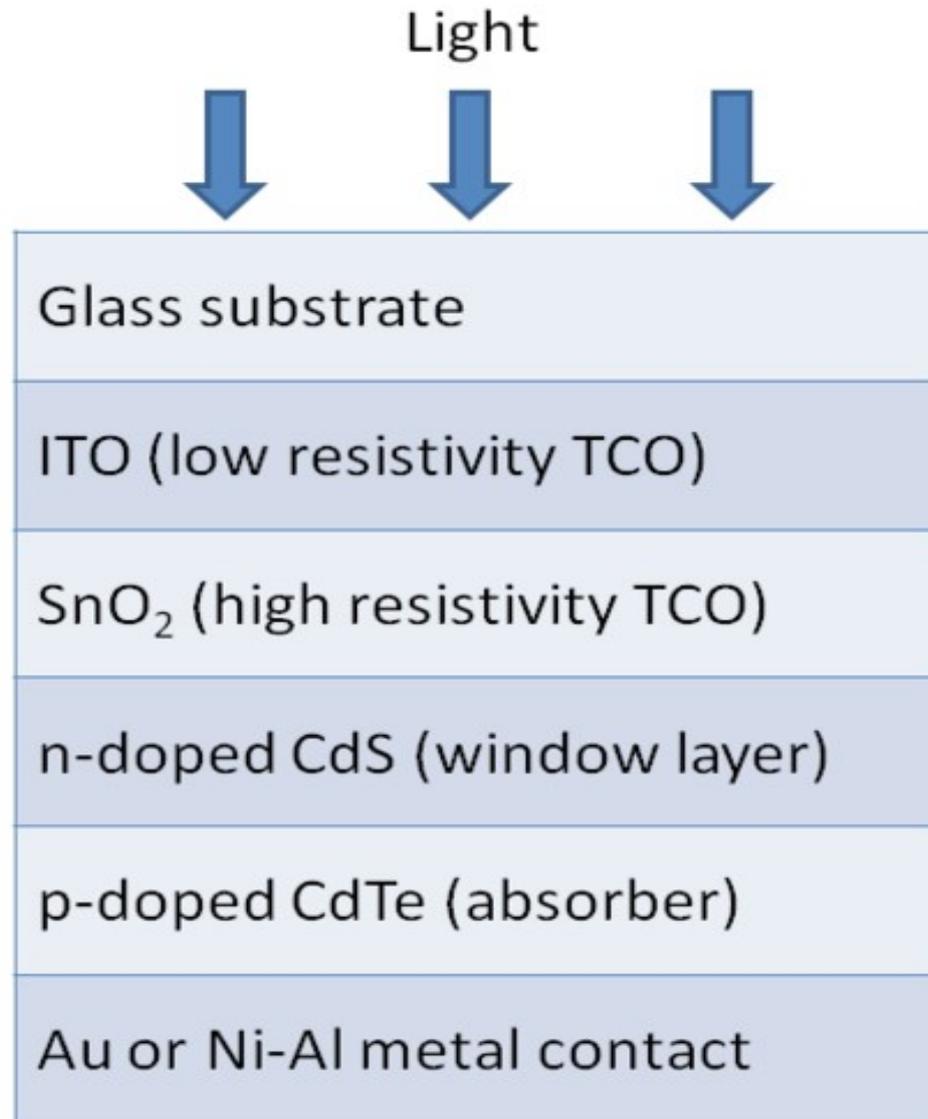
Cadmium telluride (CdTe)

Photovoltaics

■

■

Cross-section of a CdTe thin film solar cell.





Copper indium gallium selenide solar cell

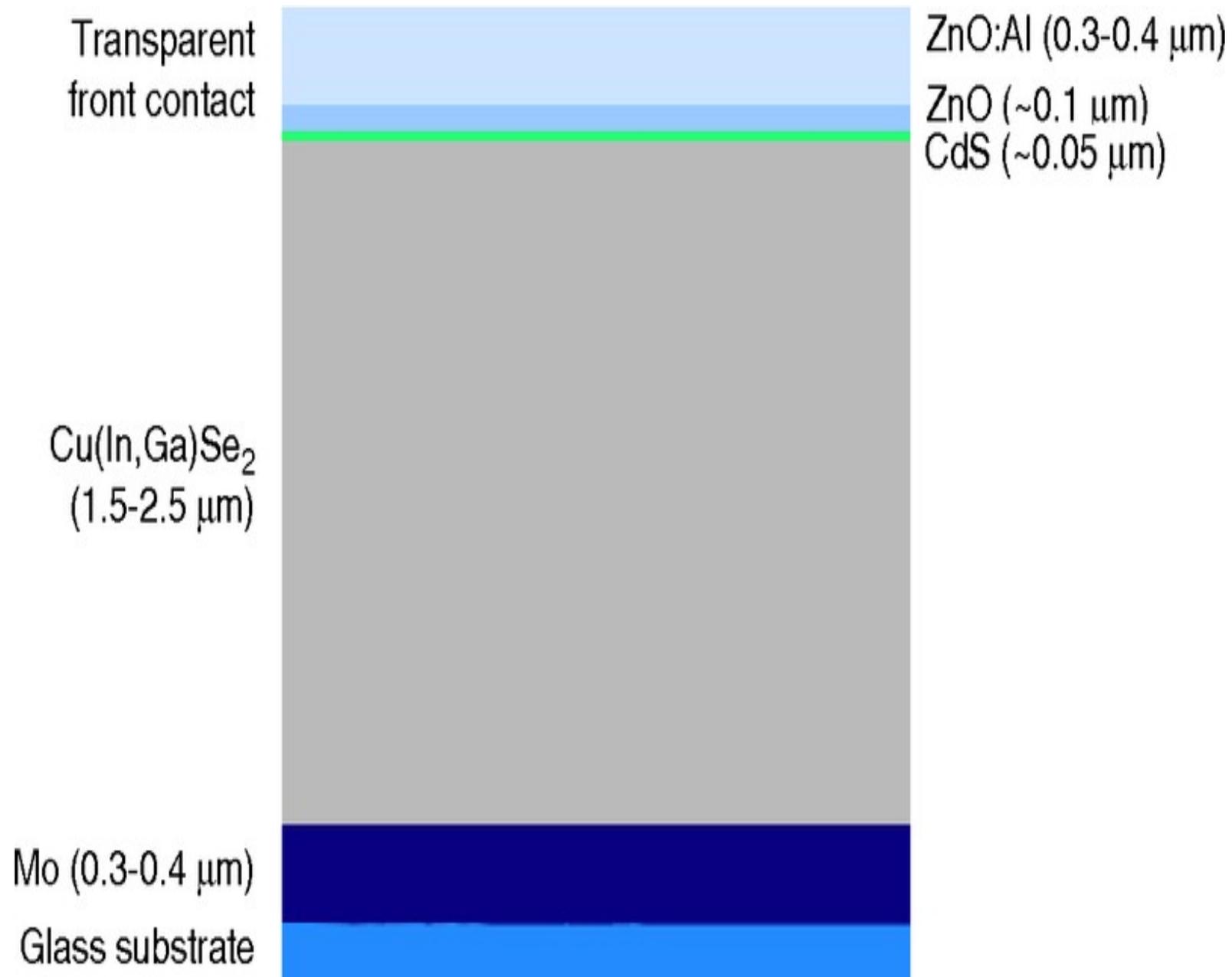
-

-

-

-

Structure of a CIGS thin-film solar cell



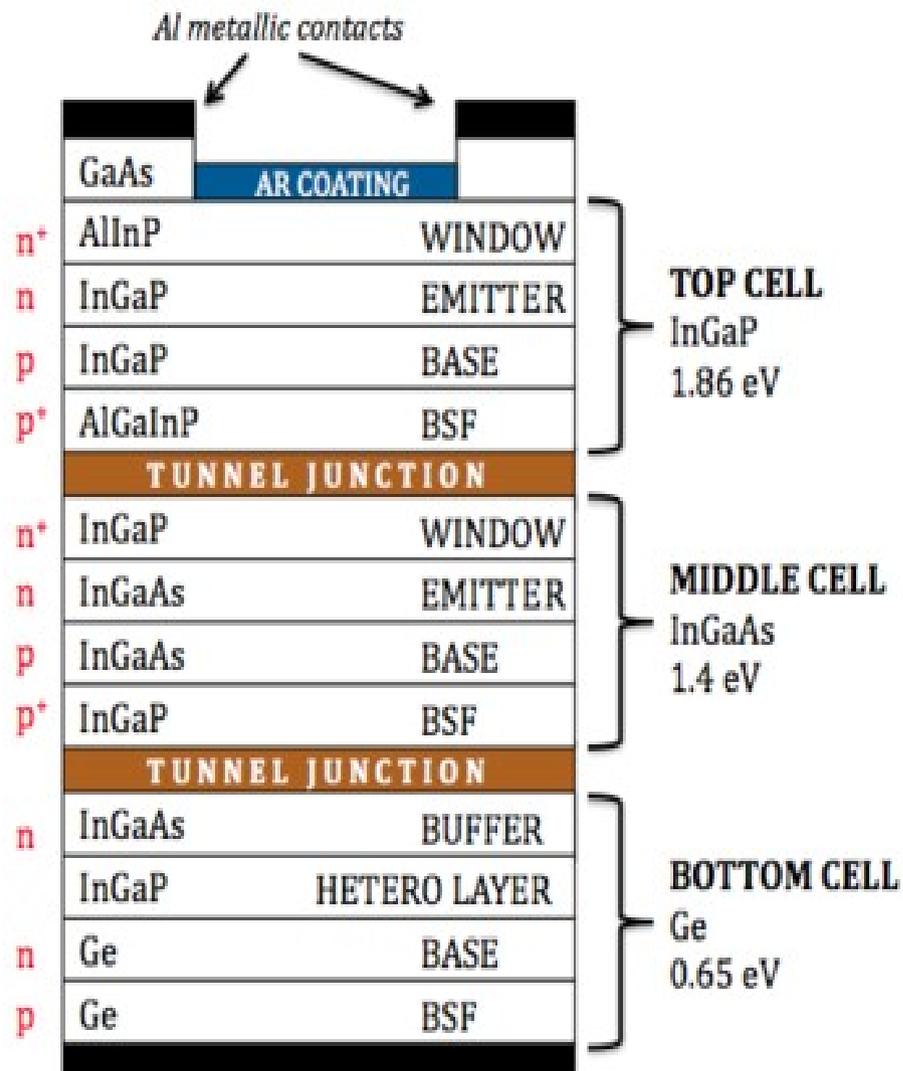
Multi-junction solar cells

-

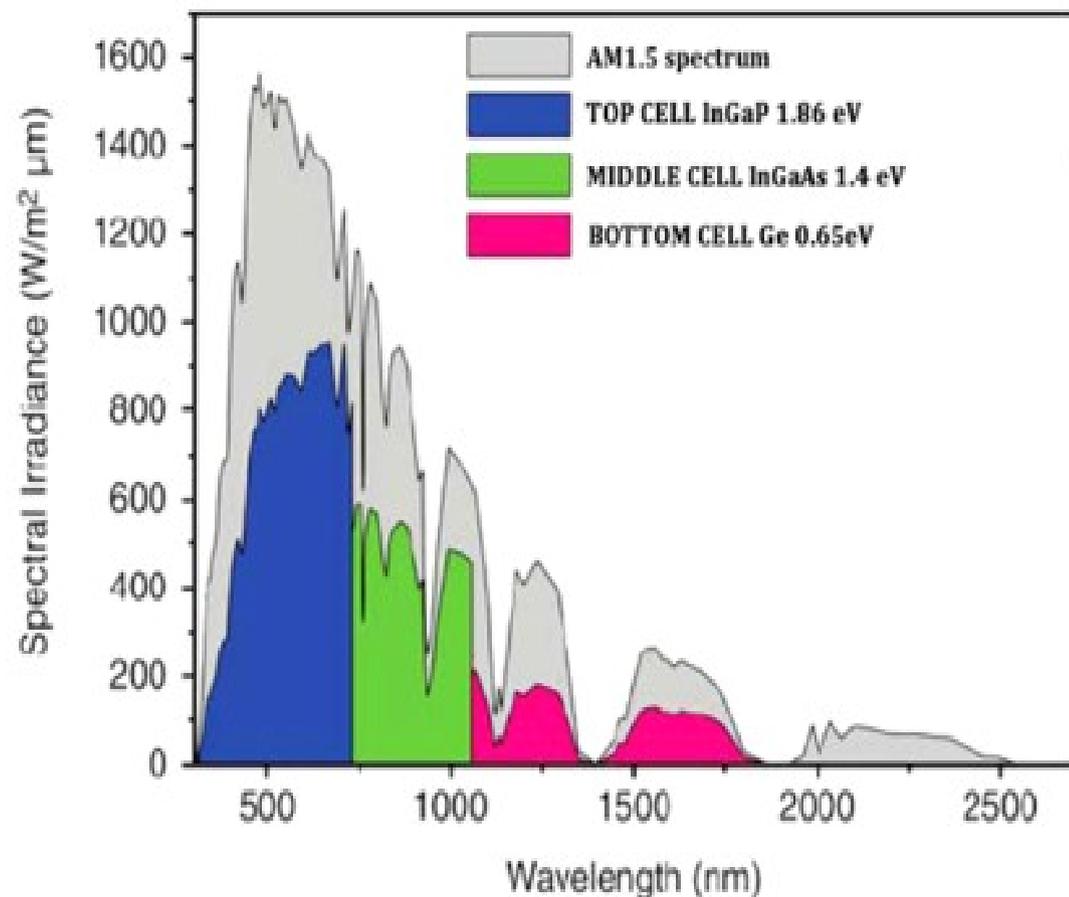
-

-

-



(a)



(b)



Dye-sensitized solar cell

-

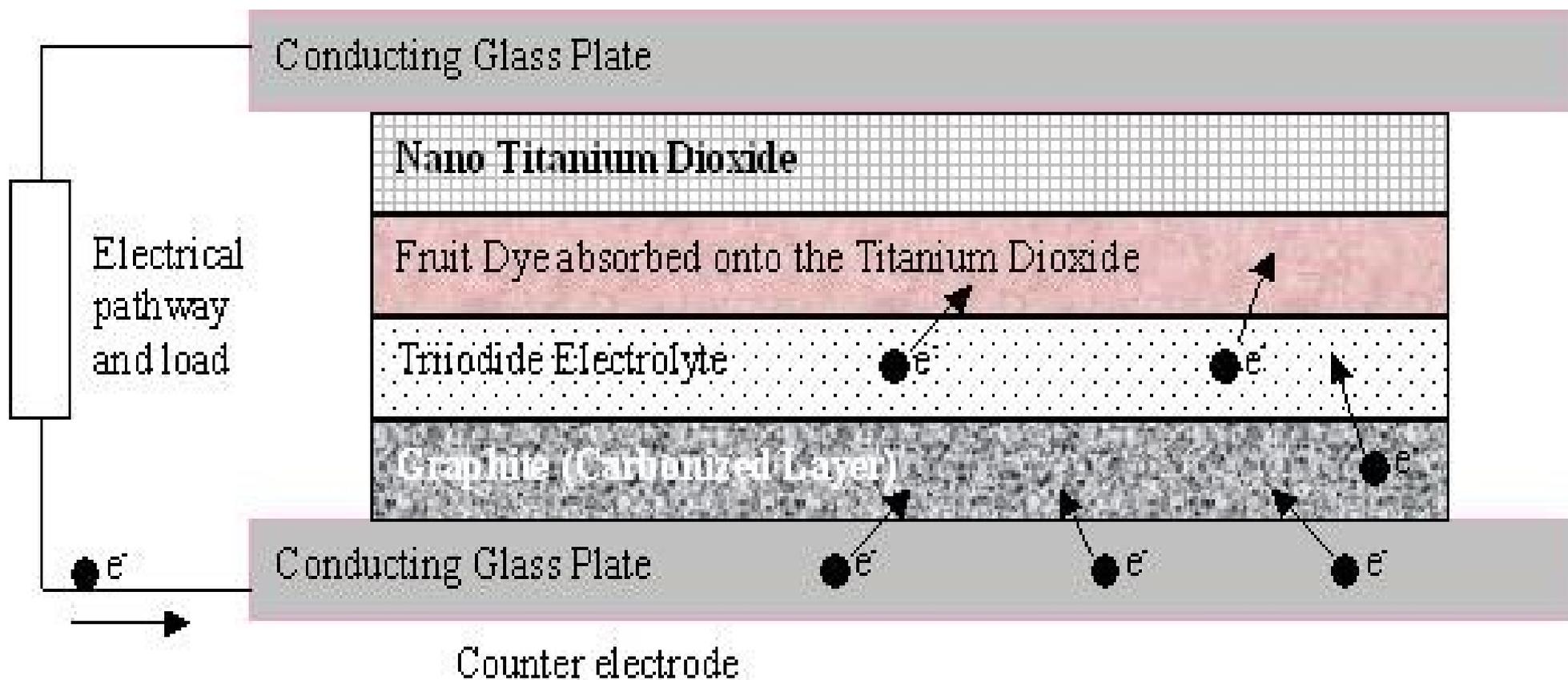
-

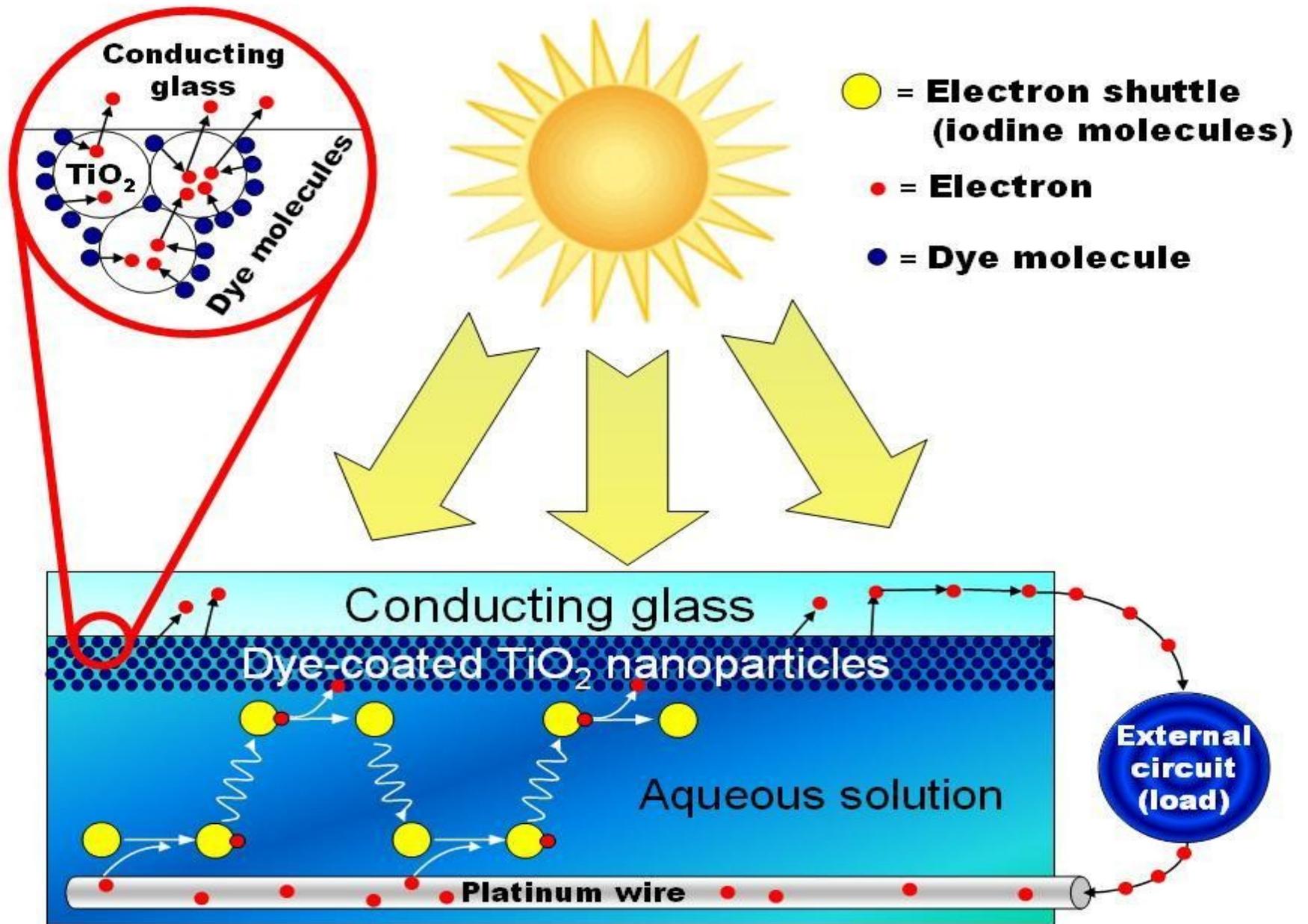
-

Structure of Dye-sensitized solar cell

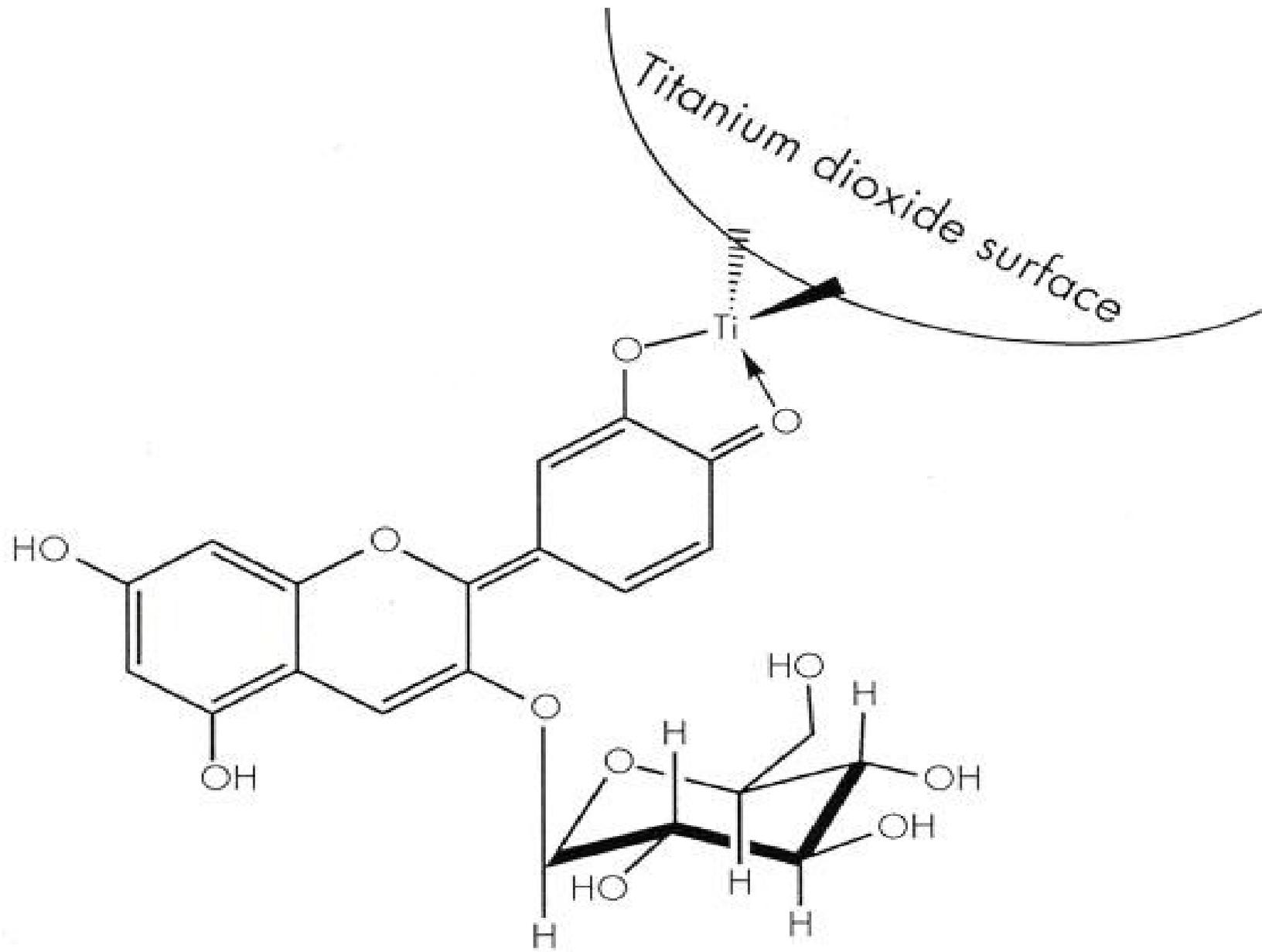
-

-





Pigment of fruit dye

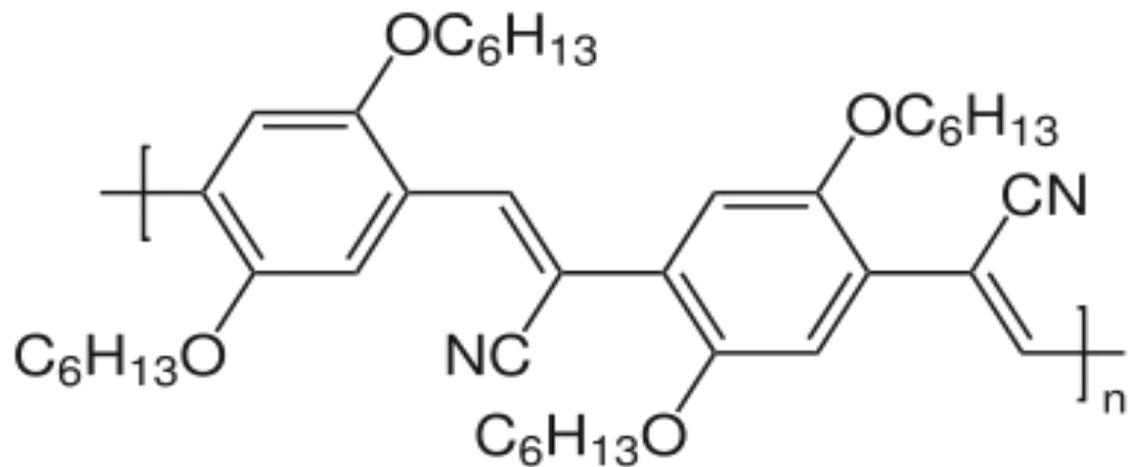


Organic Solar cell

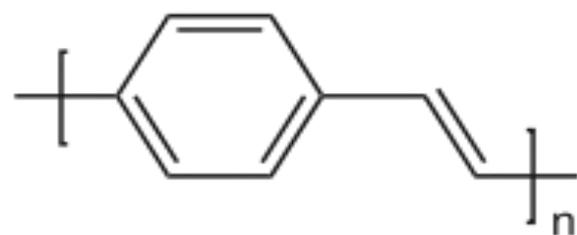
■

■

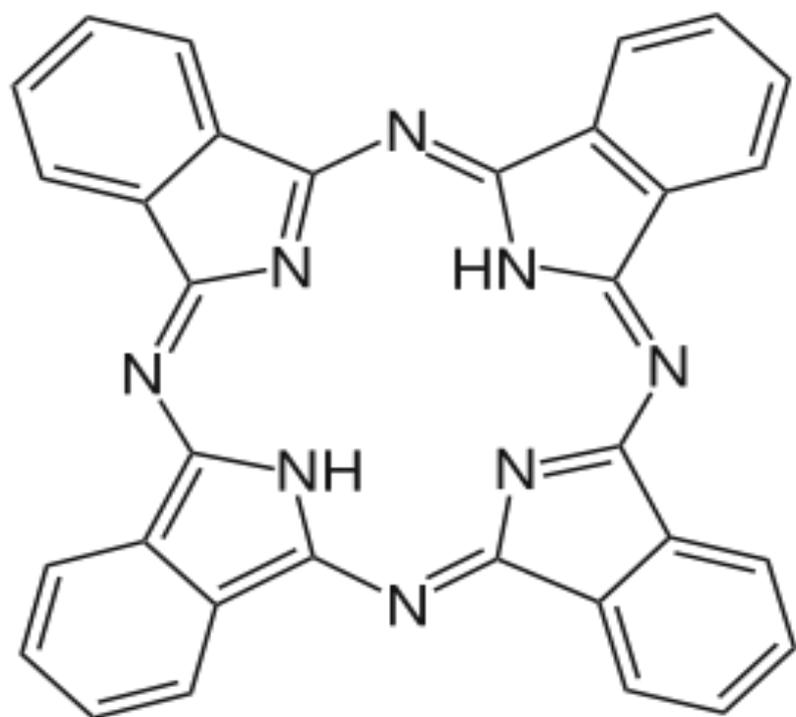
■



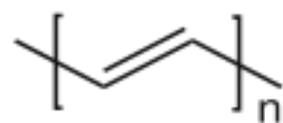
CN-PPV



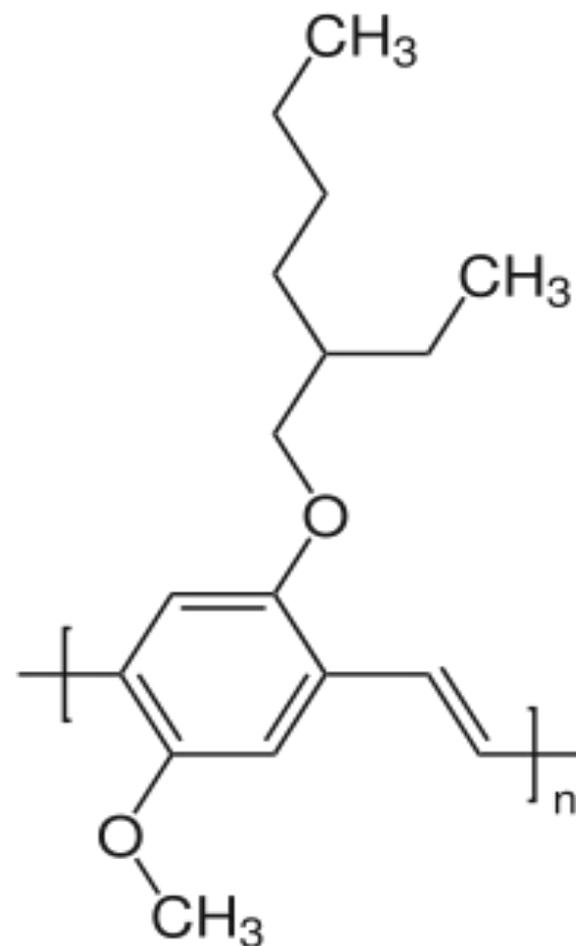
poly(phenylene vinylene) (PPV)



phthalocyanine



polyacetylene



MEH-PPV

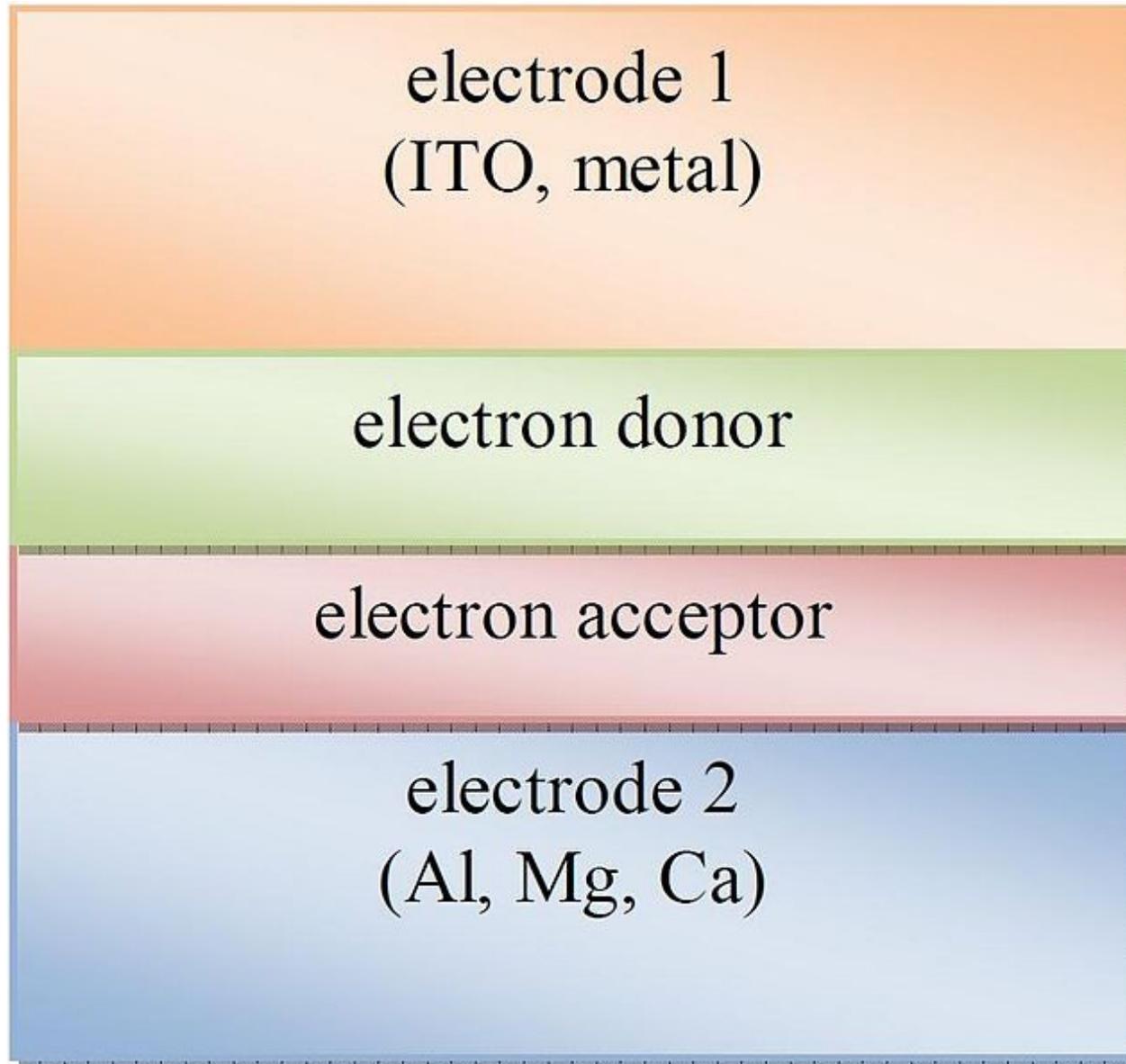
Single layer organic photovoltaic cell

electrode 1
(ITO, metal)

organic electronic material
(small molecule, polymer)

electrode 2
(Al, Mg, Ca)

Bijunction layer organic cell



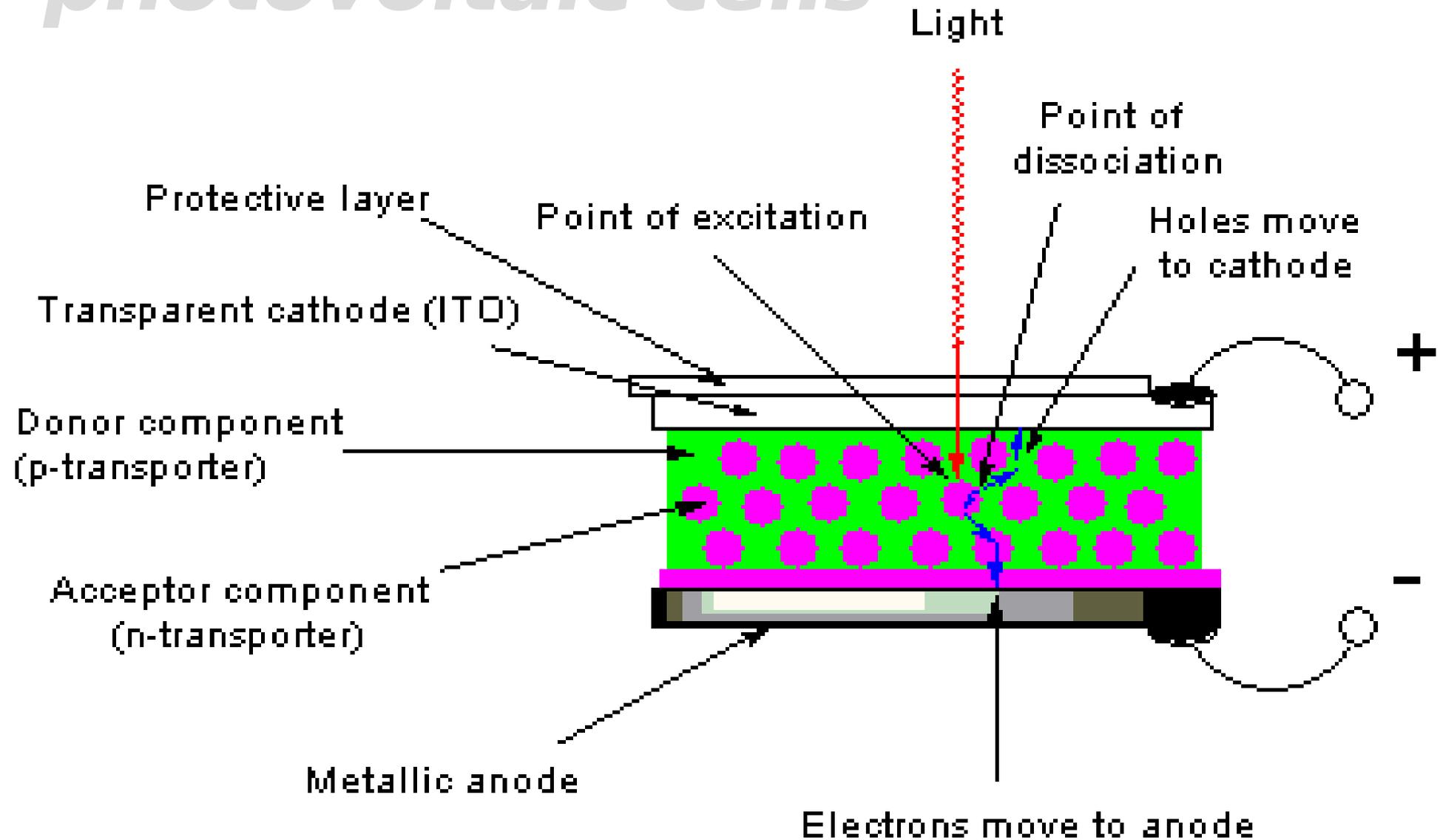
Disadvantages of single layer and bilayer solar cell

Ø

Ø

Ø

Bulk heterojunction organic solar cell photovoltaic cells



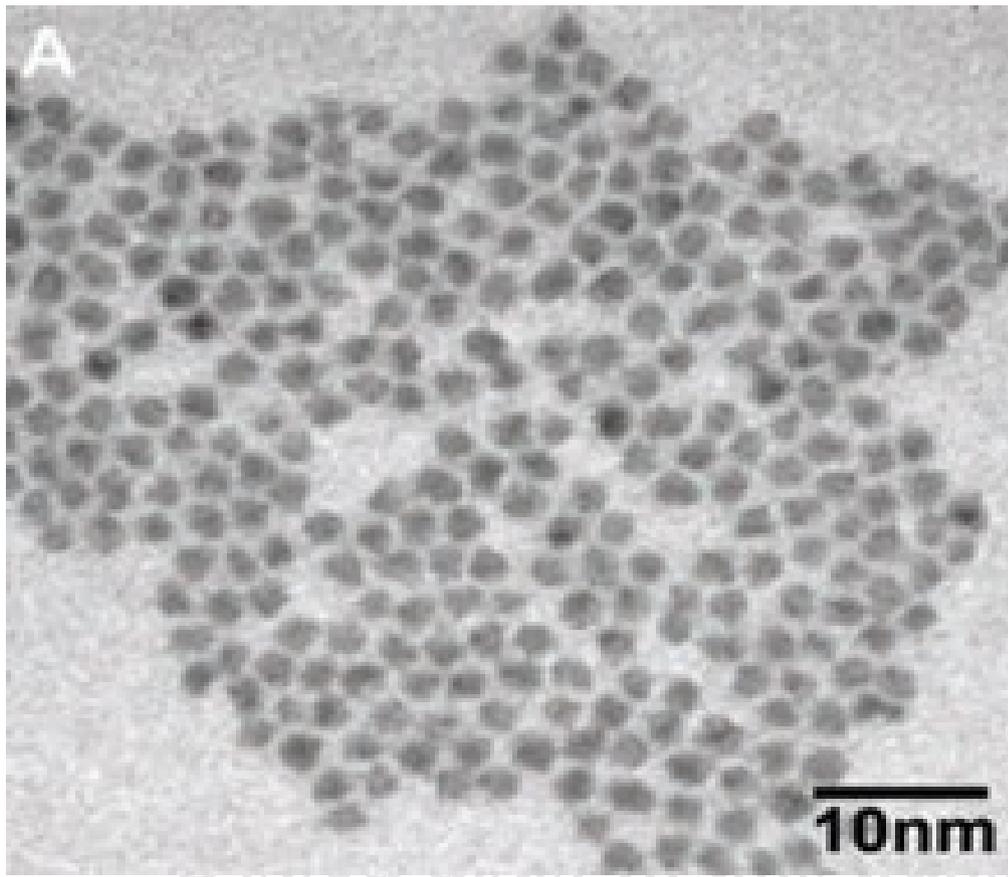
Nano crystals and Quantum dots

Quantum dots hold promise for low-cost solar cells because :

Can be made using simple, inexpensive chemical reactions

Nanocrystals can emit more electron per photon absorbed.

Tuning of nanocrystal absorption to match the solar spectrum.



Transmission electron microscope image, indium arsenide quantum dots, 3.3 nanometers wide, are doped with silver atoms, yielding an n-type material rich in electrons.

THANK YOU

