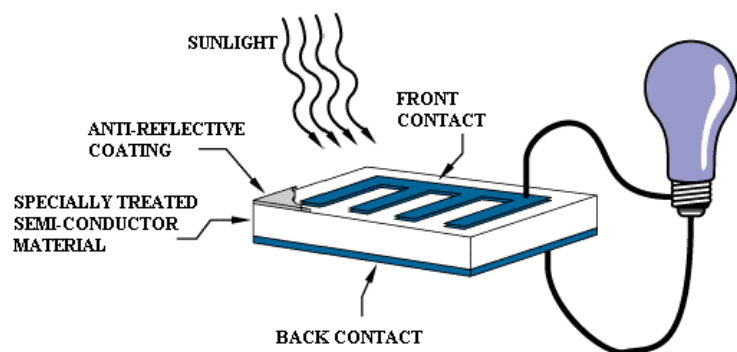


# Photovoltaic System



## The Silicon Photovoltaic Cell

For Photovoltaic System we intend an installation able to produce direct exploiting solar light. Photovoltaic systems are fixed to a structure of support and they represent the visible and most important part of the plant. Their function is to capture the solar energy with low issues of CO<sub>2</sub> in the environment and without producing substances of discard. The principal part of the system are the cells. they are made of two layers, one positive and one negative, of a semi-conductor material; the most used one is silicon, which is very common in nature however it isn't pure because it reacts with oxygen. when the sunlight hits the cell, the little particle which compose it, called photons, react with the silicon and produce an electric field generating electricity, in the form of direct current, or DC power. many cells grouped together form a pv module which are joined in many panels. then they are connected with the inverter. That is a machine which converts the DC power into AC power, or alternating current. electricity then can be used to load electronic devices or used at home.



This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation

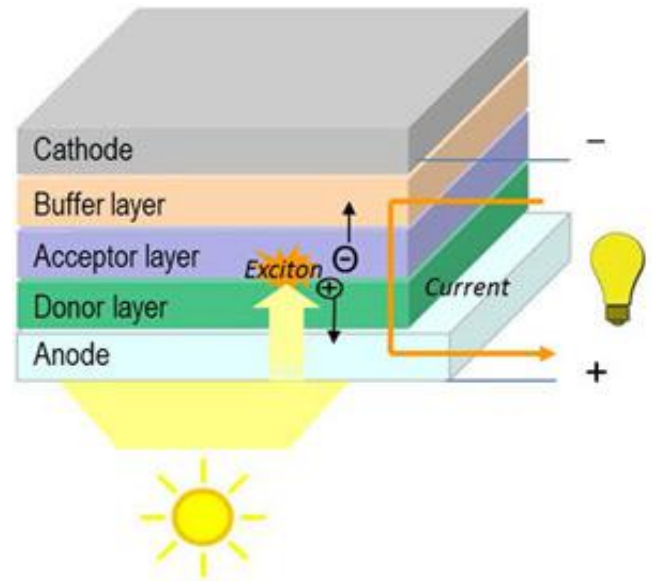
# The Organic Photovoltaic Cell

## History: Michael Grätzel

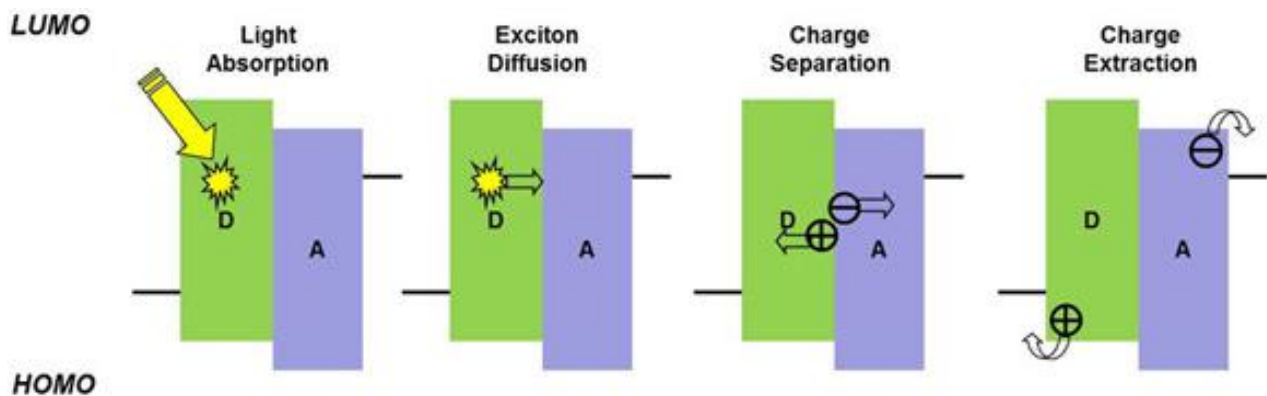
Michael Graetzel was born in Switzerland. He studied chemistry at the Berlin's University. In 1991 invented an organic photovoltaic cells, based on a process similar to the photosynthesis, called the Grätzel cell.

## What do you know about them?

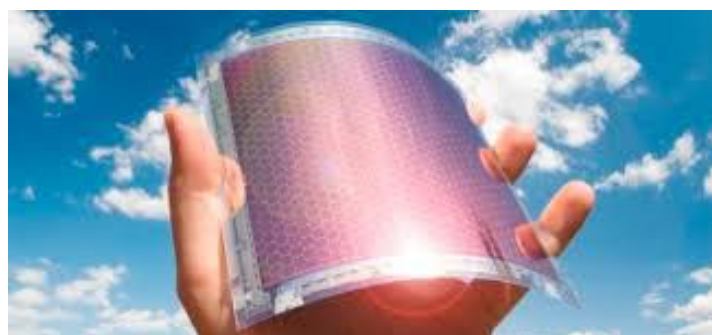
Organic Photovoltaic (OPV) devices convert solar energy into electrical energy. As the picture shows us, typical organic photovoltaic device is composed of several layers of photoactive materials, which absorb light, and inside we can find two electrodes which are electrical conductors.



The photoactive layers formed of donor and acceptor semiconducting organic materials, absorbing solar energy, produce electric current. As the figure 2 shows us, those photoactive materials collect photons from sunlight to form excitons, in which electrons are excited from the valence band into the conduction band (Light Absorption). Due to the concentration gradient, the excitons diffuse to the donor/acceptor layer (Exciton Diffusion) and separate into free holes (positive charge carriers) and electrons (negative charge carriers) (Charge Separation). A photovoltaic current is generated when the holes and electrons move to the corresponding electrodes by following either donor or acceptor phase (Charge Extraction).



That's a typical example of an organic photovoltaic device.



Thanks to this new invention we can apply these fabrics into bags or backpacks, in this way the organic cells use solar energy to produce electrical energy. These innovative models of accessories allow us to recharge our mobile phones or mp3 whenever we need to.



## Pros and Cons

### Organic Photovoltaic Cell

1. Color is adjustable
2. Strong absorption of sunlight – very thin material layers
3. Lifetime is pretty short and depends on substrate – the lifetime on flexible substrate is the topic of ongoing research and development
4. Efficiency today approximately 12%, rapid progress

### Silicon Photovoltaic Cell

1. Dark-grey material with dark-blue to black coating
2. Average absorption of sunlight – thick compared to organic solar cells, rigid plates required
3. Very long lifetime, depends on quality, 20 years warranty are common
4. Efficiency between 15% and 20%, depends on quality



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