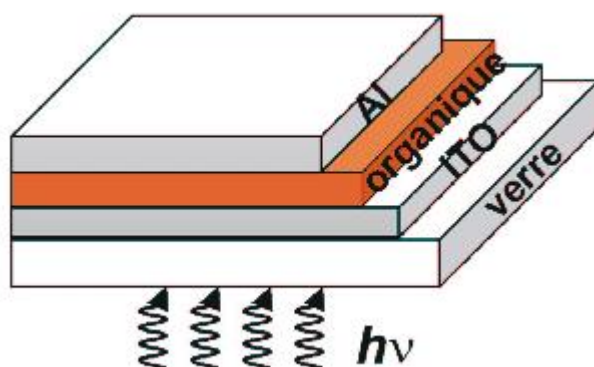


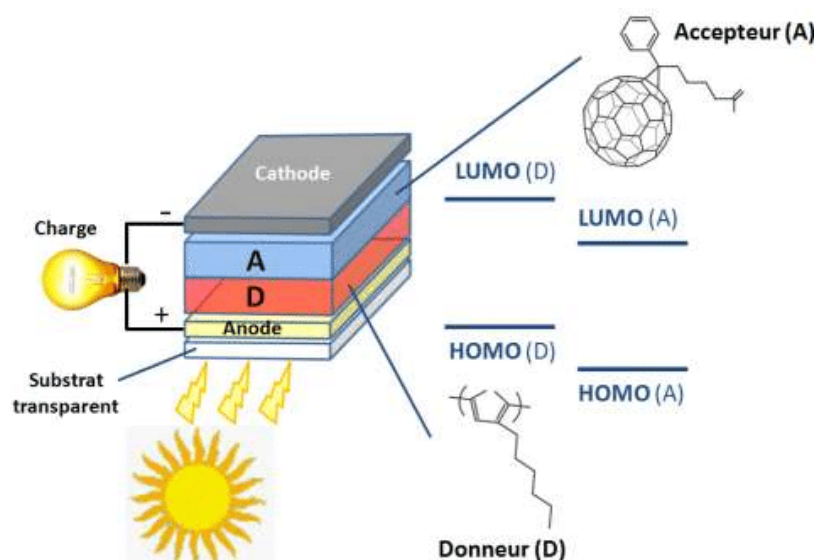
Perylenes are a class of organic molecules that have attracted increasing interest in the field of organic photovoltaics (organic PV). Their chemical structure, which includes a polycyclic aromatic system, gives them interesting electronic properties, thus favoring their use in the conversion of solar energy into electricity.

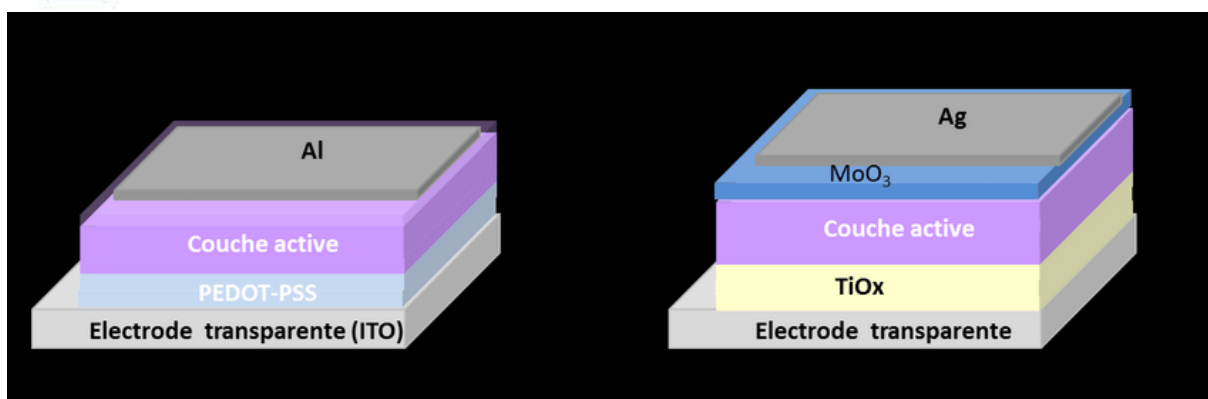
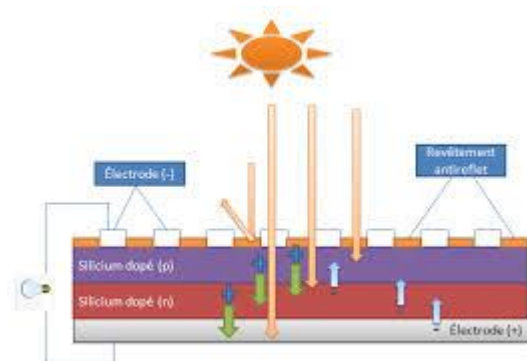


Properties of perylenes

1. Structure and Conjugation:

Perylenes are polycyclic aromatic hydrocarbons, characterized by a planar and highly conjugated structure. This conjugation allows efficient conduction of electrons, which is crucial for materials used in photovoltaic cells.

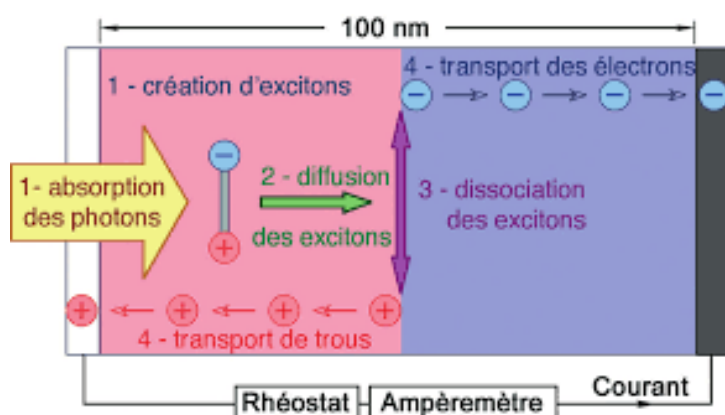




Perylenes, due to their planar and highly conjugated structure, exhibit excellent electron conduction, which is essential for photovoltaic materials. They efficiently absorb light in the visible range, thus maximizing the efficiency of solar cells.

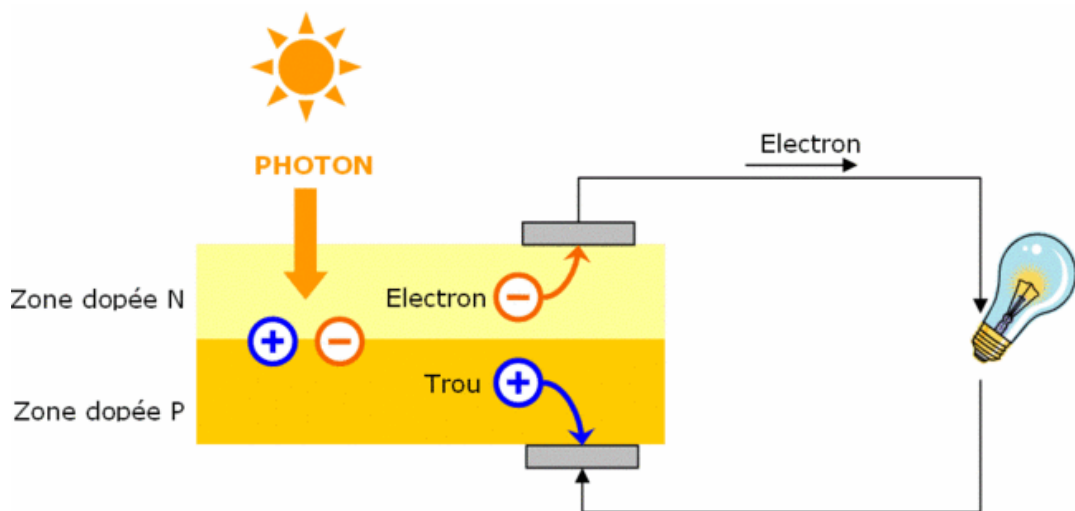
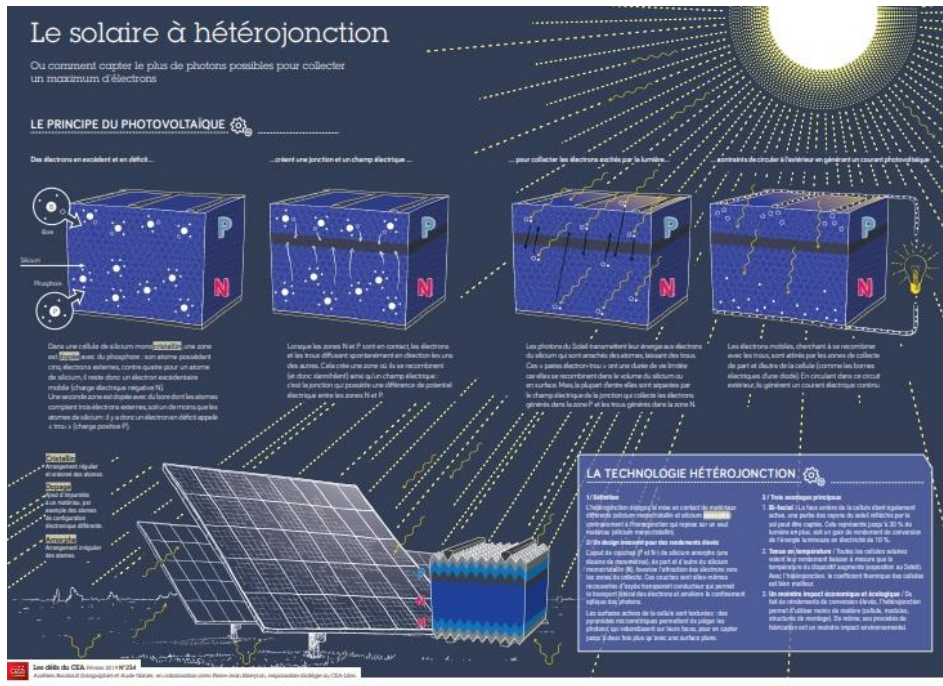
2. Light absorption:

Perylenes have good absorption properties in the visible light range. Their ability to strongly absorb sunlight is essential to maximize the efficiency of photovoltaic cells.

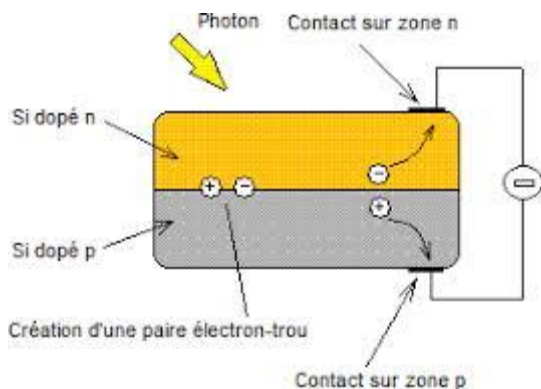


Light absorption in photovoltaic cells works through a process that transforms light energy into electrical energy. Here are the key steps in this process:

1. **Light absorption:** Photovoltaic cells contain semiconductor materials (e.g. silicon). When light (photons) hits the material, some of these photons are absorbed. The energy of the photons is then transferred to electrons.
 2. **Excitation of electrons:** Once a photon is absorbed, its energy excites an electron, causing it to move from a basal energy level to a higher energy level, creating an electron-hole pair (where the "hole" is the absence of an electron).
 3. **Generation of free charges:** The excited electrons become free to move through the material, while holes (which are vacant sites where an electron has been excited) can also move. This creates a flow of electric charges.
 4. **Separation of charges:** In a photovoltaic cell, a pn junction is often present. This structure allows electrons and holes to be separated by creating an internal electric field. This field prevents electrons and holes from recombining, thus promoting their movement towards the electrodes.
 5. **Collection of charges:** Electrons move towards the negative electrode, and holes towards the positive electrode. This movement of charges generates an electric current.
 6. **External circuit:** This current can then be directed through an external circuit to power electrical devices
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3. **Emissions and Luminescence:**
Perylenes can also emit light when excited, which can be exploited in some complementary applications, such as light emitting devices (OLEDs).



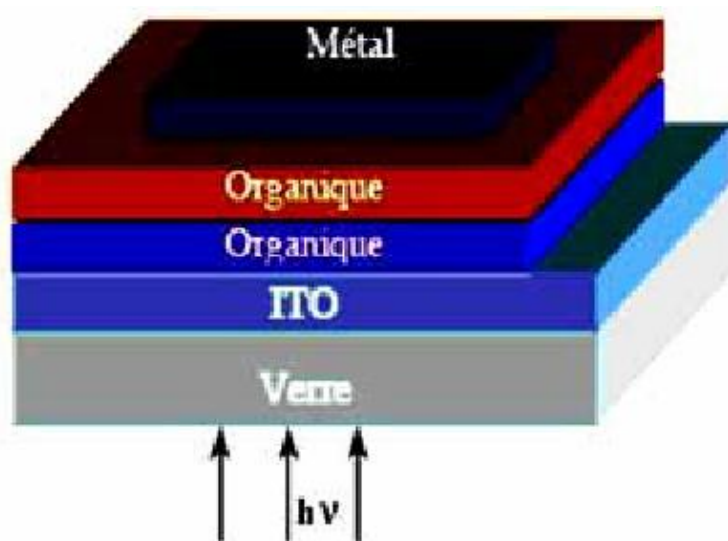
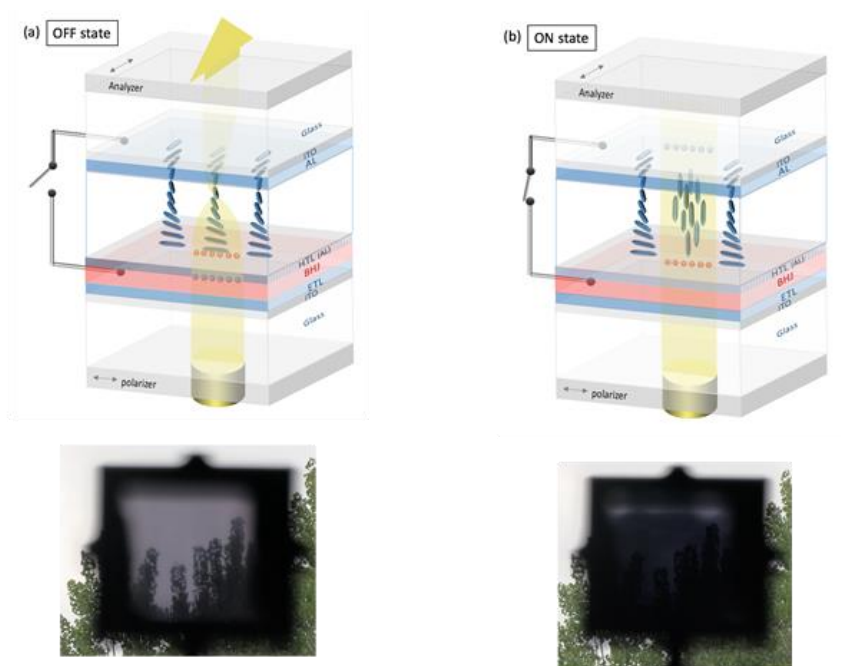
Role in organic photovoltaics



1.Active layer materials:

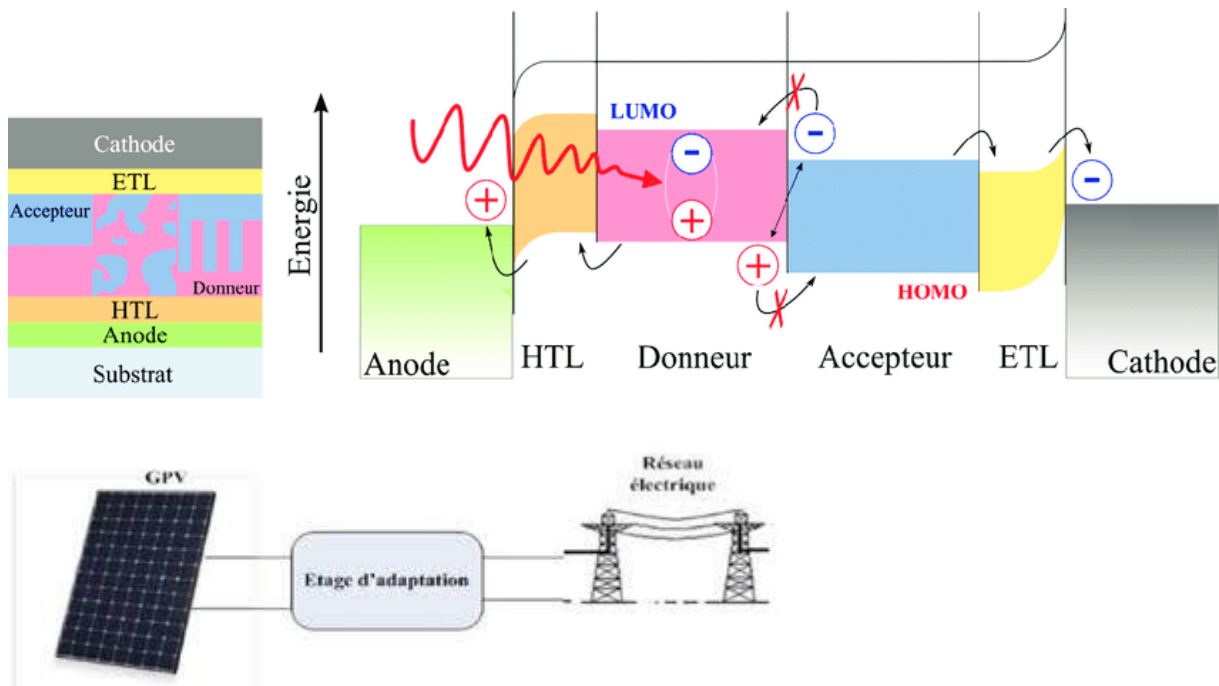
In organic solar cells, perylenes can be used as

active layer materials, often in combination with other polymers or small molecules. Their high charge mobility and absorption properties make them ideal candidates for improving cell efficiency.



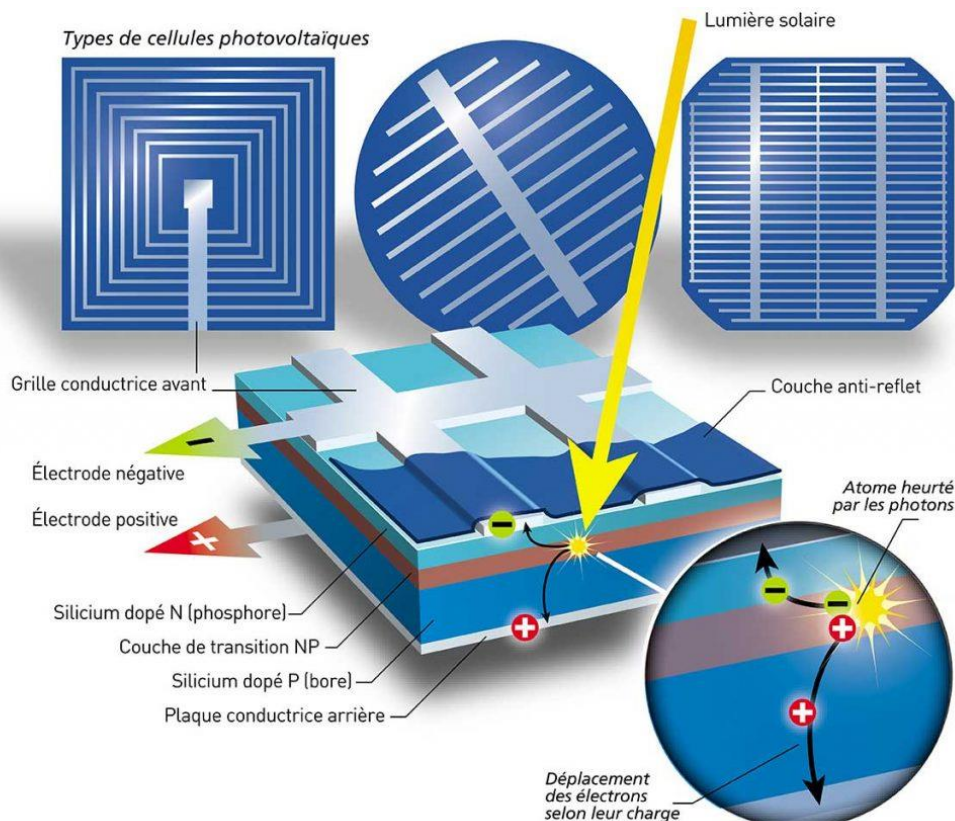
2. Interface and transport:

Perylenes can also play a role in charge transport in the cell. Their structure promotes the dissociation of excitons (excited states formed by the absorption of photons) and facilitates the transport of electrons and holes to the electrodes.



3. Stability and Durability:

A major challenge in organic photovoltaics is the stability of the materials over time. Perylenes have shown some resistance to degradation, making them a good choice for long-term applications, although further research is needed to improve their performance and durability.





Challenges and Perspectives

- **Efficiency :**
Although the use of perylenes can increase the efficiency of photovoltaic cells, achieving efficiencies comparable to traditional photovoltaic technologies (such as silicon) remains a challenge.
- **Scalability:**
The manufacture of organic solar cells from perylenes must be suitable for large-scale production and at competitive costs.
- **Continued research:**
Much research is underway to explore perylenes variants and combine them with other materials to optimize the performance of photovoltaic cells.

Conclusion

Perylenes represent a promising avenue for the development of organic photovoltaic technologies. Their ability to absorb light and transport charges efficiently is crucial for the transition to more sustainable renewable energy systems.