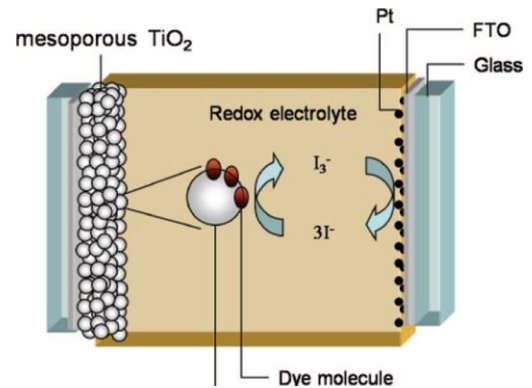


## Overview of Dye-Sensitized Solar Cells (DSSC): Key components and basic operating principle

Key components in our DSSC:

- (1) **Semi-conductor:** TiO<sub>2</sub>
- (2) **Sensitizer (dye):** N719 dye
- (3) **Redox mediator:** I<sub>3</sub><sup>-</sup> / I<sup>-</sup>
- (4) **Counter electrode:** Platinum
- (5) **Mechanical support:** FTO glass coated with TiO<sub>2</sub>



DSSC schematic; Chemical Rev. 2010, 110, 6595-6663

Electron flow in the DSSC:

1. Dye becomes excited by light.
2. Dye injects an electron very rapidly to the TiO<sub>2</sub>\* (the conduction band), dye is oxidized in the process.
3. Electrons are transported through the semi-conducting TiO<sub>2</sub>, move through the load, and eventually reach the counter electrode.
4. At counter electrode, normally platinum, the electrons reduce the redox mediator located in the electrolyte of the DSSC.
5. Redox mediator diffuses to meet and regenerate oxidized dye molecules.

\* The TiO<sub>2</sub> (or other semiconductor used in the DSSC) promotes directional flow of electrons in the solar cell. This is due to kinetics of electron movement. Once injected quickly to the TiO<sub>2</sub> (10<sup>-12</sup> seconds), electrons are not as easily recombined with the sensitizer or redox mediator (which occurs on a 10<sup>-2</sup>, 10<sup>-3</sup> second time frame). If instead, the electrons entered a metal, recombination events would be much more frequent.