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Metal-Based Electron-Transfer Mediators in Dye Sensitized Solar Cells

Dye-Sensitized Solar Cells (DSSCs) have three primary components: the photoanode, the electron transfer mediator and the cathode. The most efficient electron mediators currently used are salts of organic and inorganic cations (such as iodine and bromine) mixed with their non-ionic components (hereafter I^-/I_2 and Br^-/Br_2).

Although I^-/I_2 and Br^-/Br_2 offer efficient electron-transfer mediation, they suffer from a number of drawbacks related to their volatility and corrosiveness. This complicates the manufacturing process and limits the cathode materials to titanium or platinum. Therefore, gold, silver, nickel, iron, chromium, aluminum, copper, other metals and their alloys cannot be used. Difficulties with sealing the cells are also a significant issue for intermediate to long-term use. These limitations have been a major factor in the lack of commercialization of DSSCs.

Researchers at the University of Ferrara and Colorado State University have developed a unique set of metal complex-based electron transfer mediators for use in DSSCs. Their unique properties dramatically reduce the electron/hole recombination which typically plague cells employing mediators other than I^-/I_2 or Br^-/Br_2. They can be used by themselves or in conjunction with other redox couples to enhance DSSC performance. Most importantly, these mediators are non-corrosive and may be used with a variety of cathode materials and contact materials. In addition, it may be possible to develop solid state, polymer-based DSSCs using derivatives of these metal complexes.

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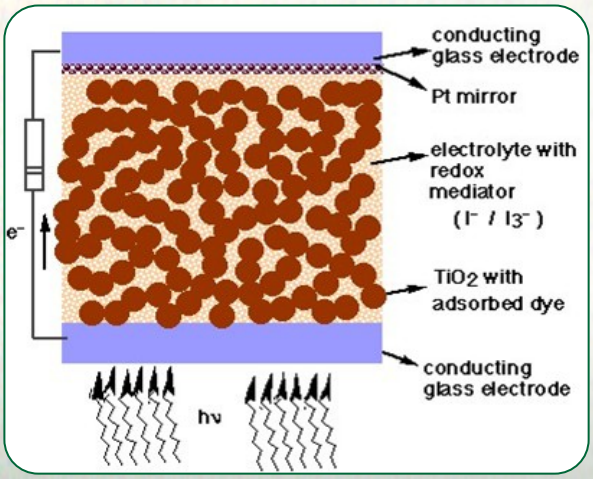
Features and Benefits

- Function efficiently under a wide range of solvent conditions.
- Non-corrosive and non-volatile.
- Compatible with a wide range of potential structure materials.
- Properties may be tuned to match non-standard DSSC systems.



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