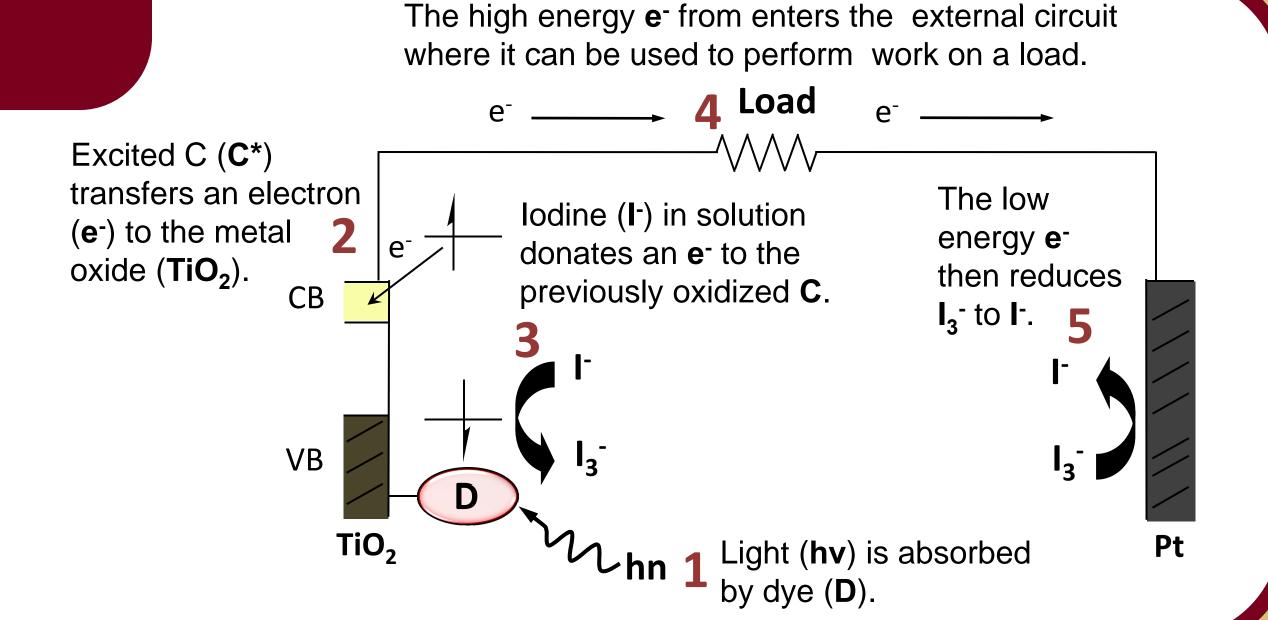
Self-Assembled Bilayers for Application in Dye-Sensitized Solar Cells

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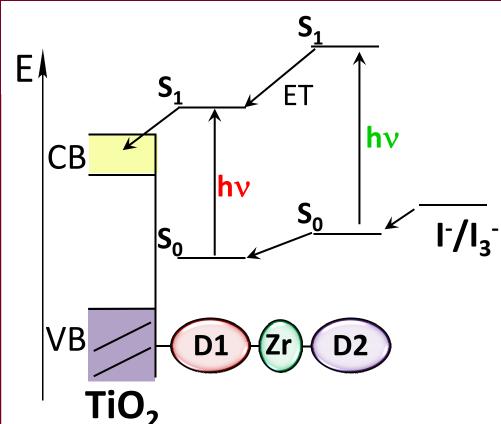
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Introduction

- DSSCs are a low-cost alternative to current solar cell technology.
- Although promising, DSSC efficiencies must increase from 13% to >15%.
- Increased light absorption is one way to enhance solar cell performance.
- This research is dedicated to improving light absorption by using self-assembled bilayers.

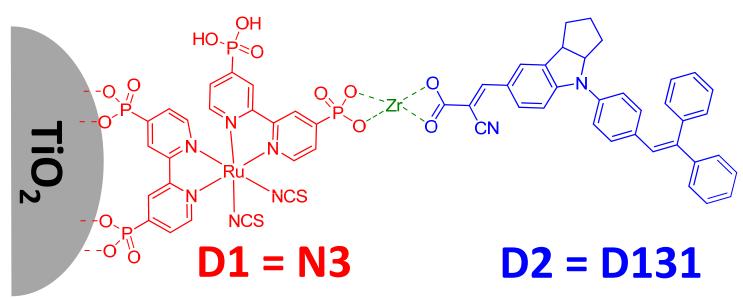


Energy Scheme

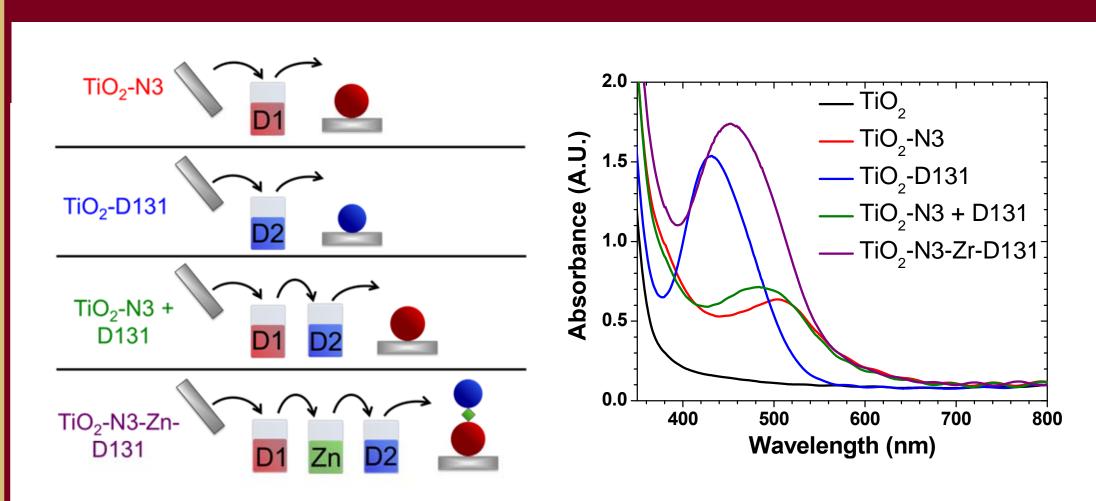


The Rules:

- Energy transfer from D2 to D1
- Electron transfer from D1* to the conduction band (CB) of TiO₂.
- Electron transfer from D2 to D1+.
- Reduction of D2+ by I-.

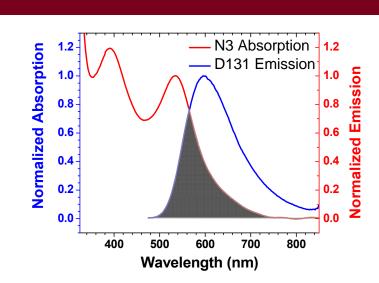


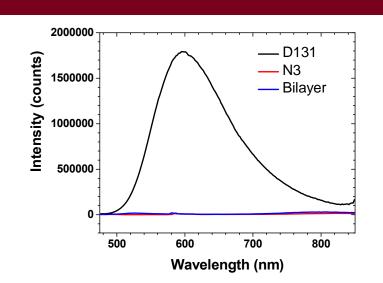
Film Formation

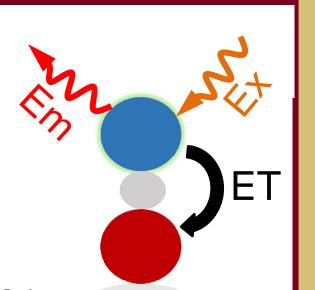


- Bilayer can be formed by stepwise soaking.
- The bilayer absorption is the sum of its parts.
- Metal ion is necessary for bilayer formation.

Energy Transfer





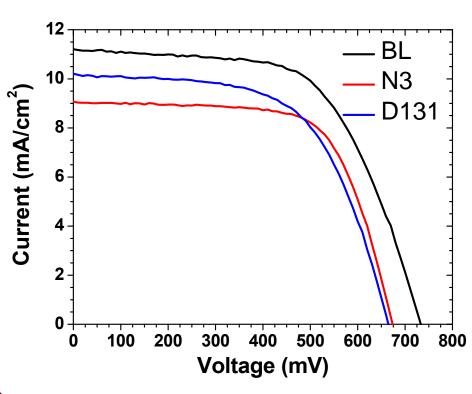


• There is good spectral overlap between D131 emission and N3 absorption.

 ZrO_2

• Emission quenching = efficient energy transfer

Device Performance



Sample	J _{SC}	V _{oc}	η
BL	11.2	730	4.96%
N3	9.07	670	4.12%
D131	10.2	660	4.07 %

- The bilayer is more efficient than the individual monolayers.
- Emission quenching = efficient energy transfer

Future Work

- Compare bilayer and co-deposited devices.
- Perform electrochemical impedance.
- Bilayer concentration dependence.
- Investigate other electrolytes.
- Tla: -1... - -1 ... -1 ... -
- Thickness dependence.
- Measure energy and electron transfer dynamics in the bilayer films.

Acknowledgements

