Photosynthesis is the biological process by which green plants utilize photons (hv) from sunlight to produce chemical energy. Photosystem I (PSI) is one of the two main protein complexes involved in photosynthesis. Upon light absorption, an excited electron is shuttled from the P700 site to the iron cluster, F680. PSI-based solar cells mimic photosynthesis by generating current from the light absorbed by the protein.

**Introduction and Objectives**

Spinach

Photosystem I (PSI) is one of the two main protein complexes involved in photosynthesis. The photocurrent density values presented are the average from multiple replicates of the same device type. Conjugated PSI-CNT device shows a higher average photocurrent density than the control devices, but also a higher standard deviation.

**Device Preparation**

Device Type 1: PSI layered on top of CNTs
- CNT suspension was drop-cast on top of lightly p-doped silicon and dried under vacuum to form a thin layer of CNTs. Dialyzed PSI extract was then drop-casted on top of the CNT film and dried.

Device Type 2: Covalent PSI-CNT Conjugation
- PSI was covalently conjugated onto the CNTs to enhance the electron transfer between the two materials and to ultimately improve the photocurrent generated from the solar device.

**Results and Conclusion**

Overlaid UV-Vis Absorbance Spectra
- The absorbances were normalized to 1.
- PSI-conjugated CNTs demonstrate the characteristic PSI absorption peaks at around 430 and 670 nm, evidencing a covalent bond between the two.

Photocurrent Density Comparison of Different Solar Device Types and Control Devices
- The photocurrent density values presented are the average from multiple replicates of the same device type.

**Future Directions**

- Optimization of CNT deposition process may lead to increased uniformity of photocurrent between devices.
- Increasing the conjugation yield by increasing reaction times or optimizing reaction conditions should further improve device performance.

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**References**