

Understanding the Curious Fluorine Impact in Polymer Solar Cells

Meyer

Scientific Achievement

Fluorine Substituents Reduce Charge Recombination and Drive Structure and Morphology Development in Polymer Solar Cells

Significance and Impact

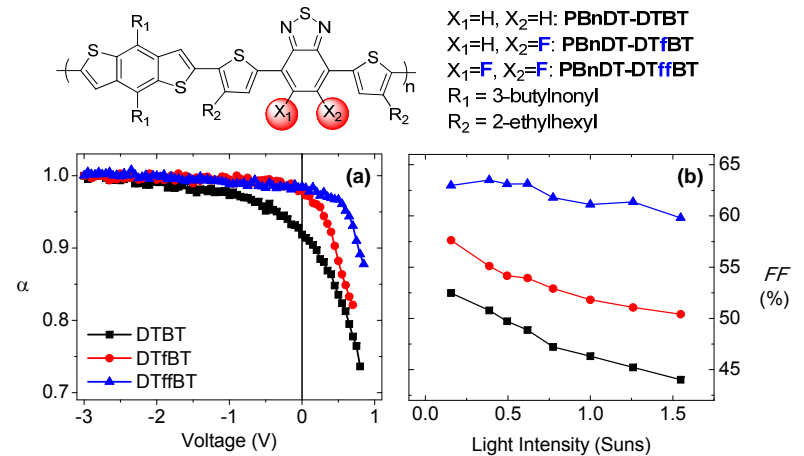
The deeper understanding of why fluorine can enhance the efficiency of polymer solar cells suggests that fluorine substitution should be generally considered in the future design of new polymers

Research Details

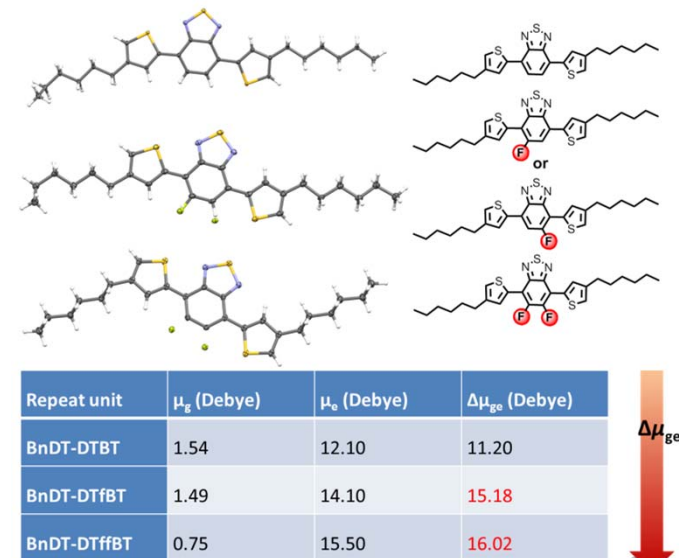
- Three structurally identical polymers, except for the number of fluorine substitutions (0, 1 or 2) are investigated in detail.
- Enhanced V_{OC} can be ascribed to a lower HOMO level of the polymer by adding more fluorine substituents.
- Improvement in J_{SC} and FF are due to suppressed charge recombination.
- Reduced bimolecular recombination is confirmed by variable light intensity studies; a plausibly suppressed geminate recombination is implied by the increased change of dipole moment between the ground and excited states ($\Delta\mu_{ge}$).
- Adding these fluorine atoms helps improve the morphology and structure in BHJ films, probed by GIWAXS and R-SoXS.

"Fluorine Substituents Reduce Charge Recombination and Drive Structure and Morphology Development in Polymer Solar Cells." Andrew C. Stuart, John R. Tumbleston, Huaxing Zhou, Wentao Li, Shubin Liu, Harald Ade, and Wei You*. *J. Am. Chem. Soc.* **2013**, 135, 1806. (DOI: [10.1021/ja309289u](https://doi.org/10.1021/ja309289u))

Work was performed at the University of North Carolina



(a) More F, suppressed bimolecular recombination



(b) More Fs, large $\Delta\mu_{ge}$: hindered geminate?