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High-performance and multifunctional organic photovoltaic devices

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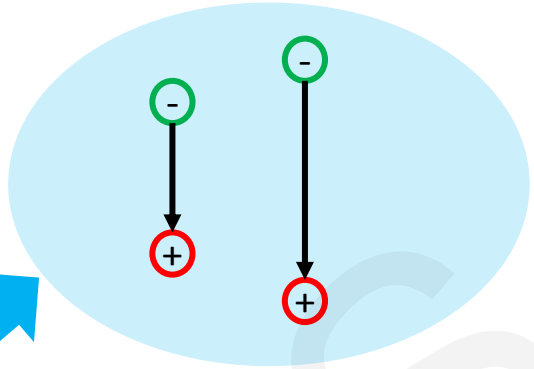
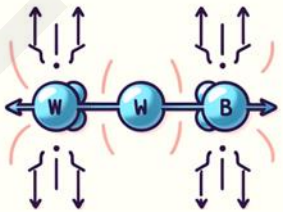
Effects of electron-vibration coupling

Electron-vibration coupling



Polarization

The larger the dipole moment, the stronger the electron-vibration coupling.



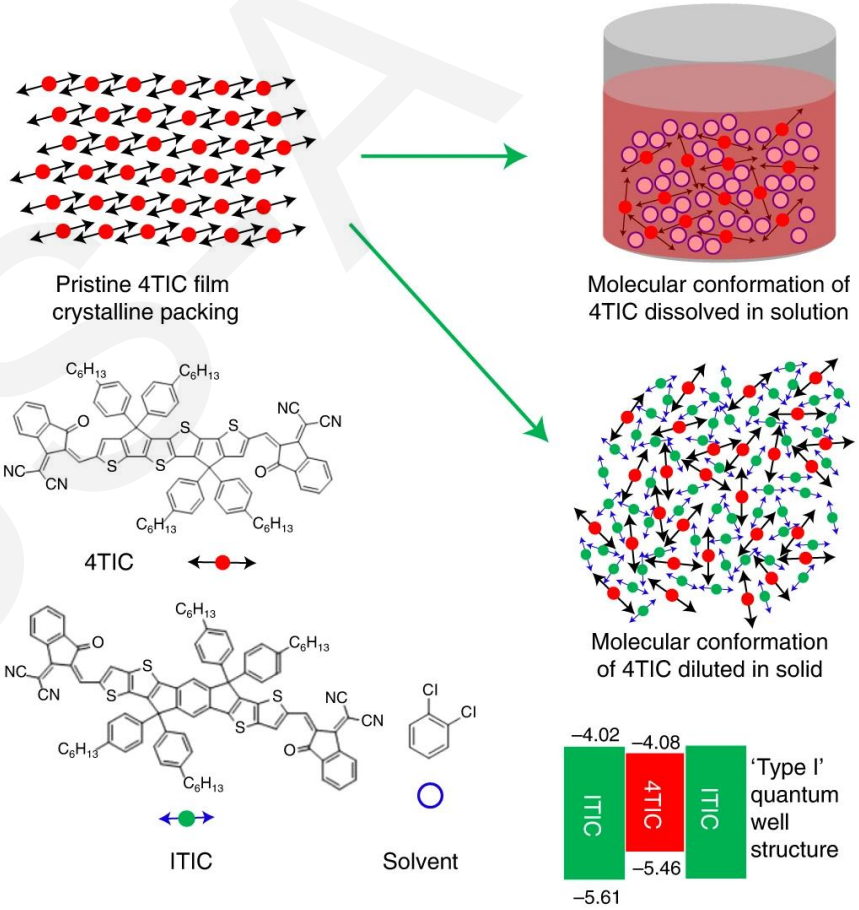
Vibration of chemical bonds

Suppressing the vibrational motion of chemical bonds can inhibit electron-vibration coupling.

Dilution effect for multi-component OPVs

The reasons for the coherency of V_{OC} in multi-component OPVs:

- **Changing the polarizability environment around the original components.**
- **Influencing the π-π stacking density.**

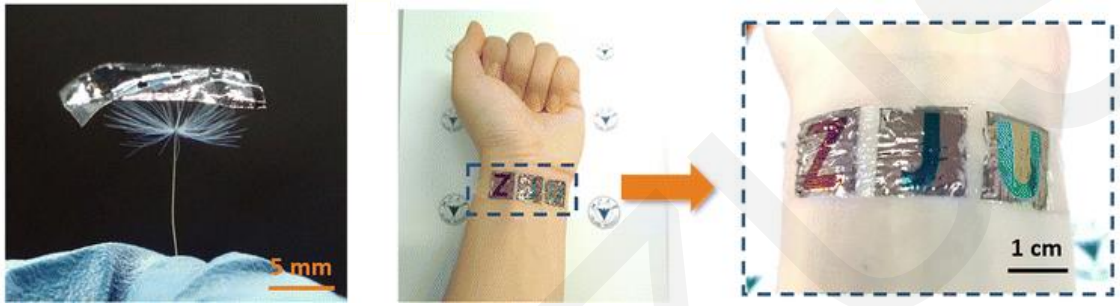


Zuo LJ, et al. *Nat. Nanotechnol.* 2022, 17, 53-60.

Multi-functional OPVs

Semitransparent OPVs

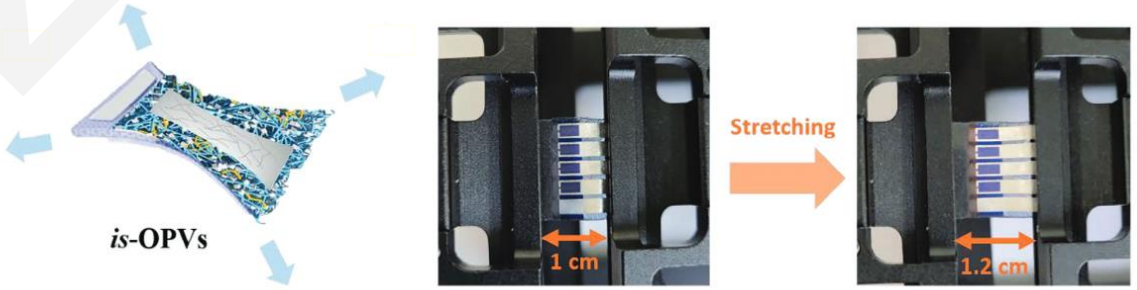
Guan ST, et al. *Adv. Mater.* 2022, 34, 2205844.



Flexible OPVs

Zheng XJ, et al. *Energy Environ. Sci*. 2023, 16, 2284–2294.

Stretchable OPVs



Zheng XJ, et al. Adv. Mater. 2023, 2307280

Summary

Over the past three years, the research group has achieved significant milestones in the following areas:

Development of multi-component OPVs: The utilization of dilution effects to elucidate variations in the open-circuit voltage (V_{OC}) of multi-component OPVs, thereby inspiring material selection guidelines for high-performance multi-component OPVs.

Introduction of the concept of absorption selectivity (*S*): Guided by the *S* to develop high-performance semi-transparent devices.

Enhancement of multifunctional OPVs: Designing cost-effective novel devices without ITO electrodes to enhance the performance of flexible/stretchable devices.