

# Organic Thin-Film Devices Using Conjugated Polymers

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## Background

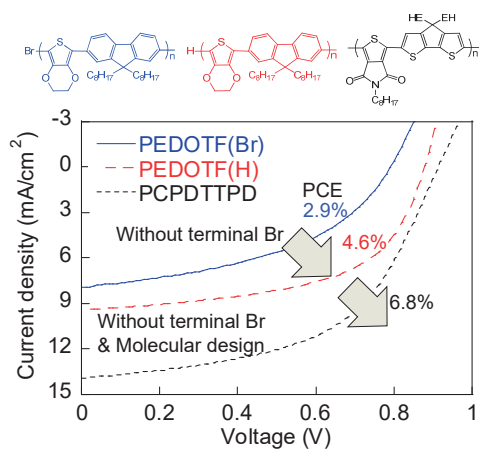
- Interest in conjugated polymer-based thin-film devices has been increasing due to the growth in the flexible electronics and circuit market.
- The development of a polycondensation reaction via the cross-coupling reaction is needed for high-performance polymer-based thin-film devices.

## Aim

- Effect of the polymer terminal structure on the device performance was systematically investigated.
- Conjugated polymers via the direct C–H/C–H cross coupling reaction without the use of prefunctionalized starting monomers were developed.

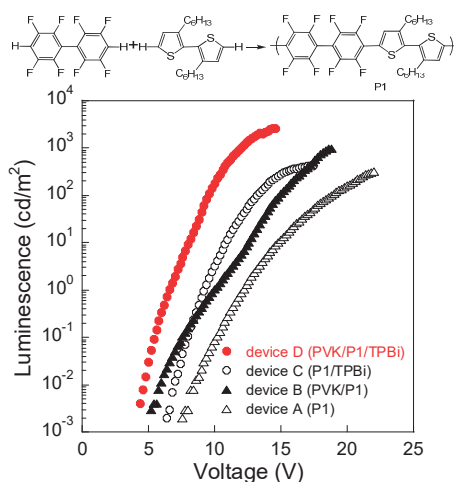
## Advanced Research Topics

Specific factors that affect the power conversion efficiencies (PCEs)



The PCE of polymer-based solar cells decreases when the devices are fabricated using polymers with Br on the terminal structure.

Development of cross coupling reactions without the use of Br-functionalized monomers



The multilayer organic LEDs using P1 sandwiched between a hole-transport layer and an electron-transport layer exhibited the best performance.

## Publications

- J. Kuwabara, T. Yasuda, N. Takase, and T. Kanbara, *ACS Appl. Mater. Interfaces*, **8** (2016) 1752–1758
- H. Aoki, H. Saito, Y. Shimoyama, J. Kuwabara, T. Yasuda, and T. Kanbara, *ACS Macro Lett.*, **7** (2018) 90–94
- T. Yasuda, H. Aoki, J. Kuwabara, and T. Kanbara, *J. Photopolym. Sci. Technol.*, **31** (2018) 323–327

## Summary

- The terminal Br structure is the dominant factor that can be modified to improve the PCE.
- The conjugated polymer via the cross coupling reaction without the use of Br-prefunctionalized monomers was developed for organic LEDs.

## Research outcome

- Expanding the availability of the protocol for other aromatic monomers.
- Improvement of molecular designs and device structures for high-performance devices.