

## Phosphonylation of Poly(9,9-dioctylfluorene) via Direct Electron Transfer at Anode

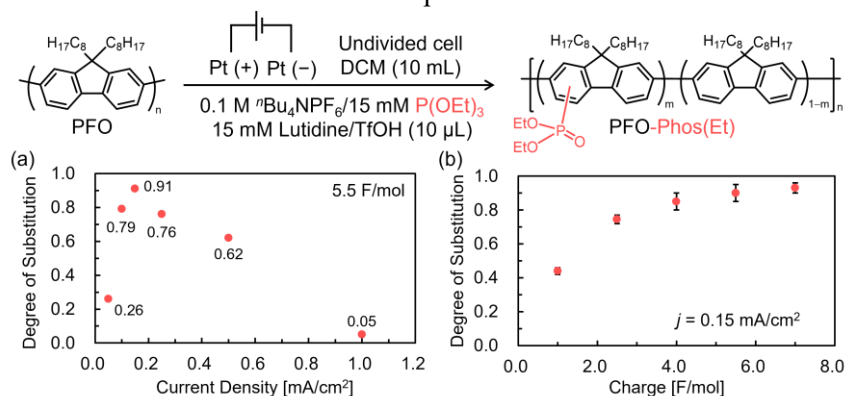
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Electrochemical polymer reactions are promising methods for the functionalization of polymers, allowing precise control through electrochemical parameters such as the amount of charge passed and current density. To date, electrochemical reactions of  $\pi$ -conjugated polymers in the film state have been explored.<sup>[1,2]</sup> However, the range of applicable polymer derivatives is limited to those stable in the film state on the electrode surface without detaching during electrolysis. Given these challenges, electrolysis of polymer solutions has significant potential to improve the versatility of electrochemical polymer functionalization. In this study, we investigated the anodic phosphonylation of  $\pi$ -conjugated polymers such as poly(9,9-dioctylfluorene) (PFO) in solution.

First, we conducted the anodic phosphonylation of PFO, resulting in a high degree of substitution (0.91) at a low current density (Figure 1 (a)). The diffusion coefficient of PFO was  $2.5 \times 10^{-7}$  while that of 2,7-bis[4-(1,1-dimethylethyl)phenyl]-9,9-dimethyl-9H-fluorene was  $6.5 \times 10^{-6}$ , indicating that a low current density is required for efficient electron transfer between the polymer and the electrode. Additionally, the degree of substitution could be controlled by tuning the amount of charge passed (Figure 1 (b)). In this presentation, the more detailed results and discussion will be explained.



**Figure 1.** Anodic phosphonylation of PFO. (a) the plot of the degree of substitution vs. current density and (b) the trace of the degree of substitution with various amounts of passed charge.

### References

- [1] S. Inagi, T. Fuchigami, *Macromol. Rapid Commun.*, **2014**, 35, 854–867.
- [2] T. Kurioka, S. Inagi, *Chem. Rec.*, **2021**, 21, 2107–2119.