

ナフト[2,3-*b*:6,7-*b'*]ジフラン骨格を持つ新規ラダー型 π 共役化合物の合成と半導体特性

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Synthesis and Semiconducting Properties of Ladder-type π -Conjugated Compounds with a Naphtho[2,3-*b*:6,7-*b'*]difuran Skeleton

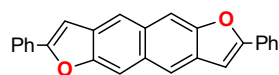
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Ladder-type π -conjugated compounds containing heterocycle(s) have been reported to show excellent semiconducting properties. For instance, organic field-effect transistors (OFETs) with 2,7-diphenylnaphtho[2,3-*b*:6,7-*b'*]difuran (DPNDF) as a semiconducting layer demonstrate charge carrier mobility as high as $0.6 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$.¹ In this work, we designed and synthesized the π -extended version of DPNDF, dibenzo[*d,d'*]naphtho[2,3-*b*:6,7-*b'*]difuran derivatives (DBNDF and C₁₀-DBNDF). Their semiconducting properties were evaluated using OFET devices with their thin films.

Keywords: Furan, Ladder-type π -Conjugated Compounds, Semiconducting Property, Optical Property

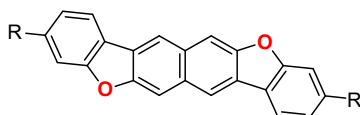
ヘテロ環をもつラダー型 π 共役化合物は優れた半導体特性を示す。例えば、2,7-ジフェニルナフト[2,3-*b*:6,7-*b'*]ジフラン (DPNDF) を半導体層とする有機電界効果トランジスタ (OFET) が $0.6 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ 程度の高い移動度を示すことが報告されている¹。今回、DPNDF の両端にベンゼン環を縮環させたジベンゾ[*d,d'*]ナフト[2,3-*b*:6,7-*b'*]ジフラン (DBNDF) と直鎖アルキルを導入した誘導体 (C₁₀-DBNDF) を設計し、その合成に成功した。また、得られた化合物を用いた OFET を作製し、半導体特性を評価した。

Reported molecule

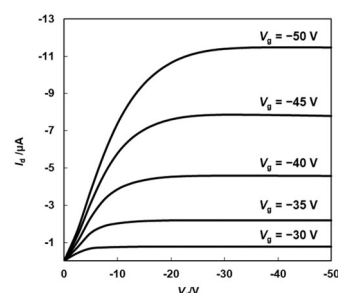


DPNDF ($\mu < 0.6 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$)

This work



DBNDF (R: H) ($\mu < 9 \times 10^{-3} \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$)
C₁₀-DBNDF (R: C₁₀H₂₁) ($\mu < 0.3 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$)



Output characteristic of the OFET device using C₁₀-DBNDF.

(1) Mitsui, C.; Soeda, J.; Miwa, K.; Shoyama, K.; Ota, Y.; Tsuji, H.; Takeya, J.; Nakamura, E. *Bull. Chem. Soc. Jpn.* **2015**, 88, 776.