

キノキサリン骨格を基盤とする新規分子内電荷移動型色素の合成と熱活性遅延蛍光特性

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Synthesis and Thermally Activated Delayed Fluorescence Properties of Novel Quinoxaline-Based Intramolecular Charge Transfer Dyes (¹*Graduate School of Engineering, Osaka Metropolitan University*, ²*Graduate School of Engineering, Osaka Prefecture University*) ○Hiroaki Chihara,¹ Masaki Nagaoka,¹ Naoya Suzuki,^{1,2} Shintaro Kodama,^{1,2} Takeshi Maeda,^{1,2} Shigeyuki Yagi,^{1,2}

Donor–acceptor (D–A)-type fluorescent dyes with spatially separated highest occupied and lowest unoccupied molecular orbitals (HOMO and LUMO, respectively) often exhibit thermally activated delayed fluorescence (TADF) which contributes to improvement of device efficiencies in organic light-emitting diodes (OLEDs). While electron acceptors with strong electron-withdrawing resonance effects, such as cyano and sulfonyl functional groups, have been frequently employed for TADF emitters, relatively limited reports are found for molecular frameworks with inductive electron-withdrawing groups as the acceptors. In this work, we synthesized quinoxaline-based D–A-type molecules with 3,6-di-*tert*-butylcarbazol-9-yl and trifluoromethyl-functionalized phenyl groups as the donor and the acceptor, respectively (Fig. 1, **1p** and **1m**) and investigated their TADF behavior. Both compounds showed high photoluminescence (PL) quantum yields in toluene and poly(methyl methacrylate) film under nitrogen atmosphere, compared to those under aerobic conditions, and the PL decay showed the presence of both prompt and delayed emission components. Furthermore, in both of **1p** and **1m**, the contribution of the delayed emission components increased with an increase in temperature. These results indicated the present D–A-type molecules exhibit TADF-based PL.

Keywords : Thermally activated delayed fluorescence; Donor–acceptor dye; Trifluoromethyl group; Intramolecular charge transfer; Quinoxaline

HOMO と LUMO が空間的に分離された電子ドナー–アクセプター (D–A) 型蛍光色素はしばしば、熱活性遅延蛍光 (TADF) を示す。TADF を利用した OLED は電流励起で生成した励起子を最大 100% 利用できるため、TADF を示す発光材料は近年注目を集めている。一般に、D–A 型 TADF 材料ではシアノ基のような共鳴効果に基づく電子求引性基がアクセプター基として用いられており、誘起効果に基づく電子求引性基を導入した骨格の報告例は限られる。本研究ではキノキサリンを基盤骨格とし、トリフルオロメチル基で修飾したフェニル基をアクセプター部位とする **1p** と **1m** (Fig. 1) を合成し、それらの TADF 特性について検討した。

1p と **1m** はともに、トルエン溶液ならびにポリメタクリル酸メチル薄膜中において、大気下に比べて窒素雰囲気下で高い発光量子収率を示した。また、発光寿命測定では即時蛍光成分と遅延蛍光成分がともに観測され、昇温に伴い遅延蛍光成分の寄与が増大した。以上の結果から、**1p** と **1m** はともに TADF を示すことが示唆された。

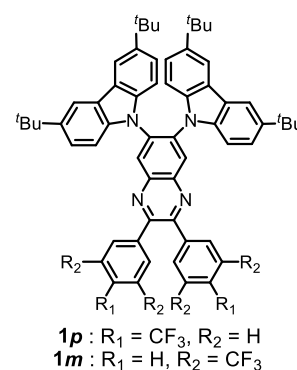


Fig. 1. Chemical structures of **1p** and **1m**.