

溶液プロセスにより作製した有機薄膜レーザーの CW 駆動

Continuous Wave Operation Based on Solution-Processable Organic Thin Film Lasers

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Novel fluorene-based semiconductors dyes, SFCz, BSFCz, and BSTFCz (Fig. 1a) which showed excellent photophysical properties were investigated in terms of their amplified spontaneous emission (ASE) and surface emission laser thresholds using a mixed-order or second-order distributed feedback resonator structure, and under continuous-wave (CW) regime. Films of SFCz, BSFCz, and BSTFCz, which were blended with tris(4-carbazoyl-9-ylphenyl)amine (TCTA) at 6 wt.%, showed photoluminescence quantum yield values of 71, 76, and 80%, respectively. The radiative decay constants of these films were in the range of 10^9 s^{-1} . The lowest ASE threshold of $0.7 \mu\text{J cm}^{-2}$ and surface emission laser threshold of $0.5 \mu\text{J cm}^{-2}$ were obtained from a BSTFCz based device. Among these dyes, BSFCz exhibited CW lasing profiles with good stability up to 10 ms (Figs. 1b and 1c). To the best of our knowledge, this is the first ever demonstration of solution processable organic lasers which work under CW regime¹.

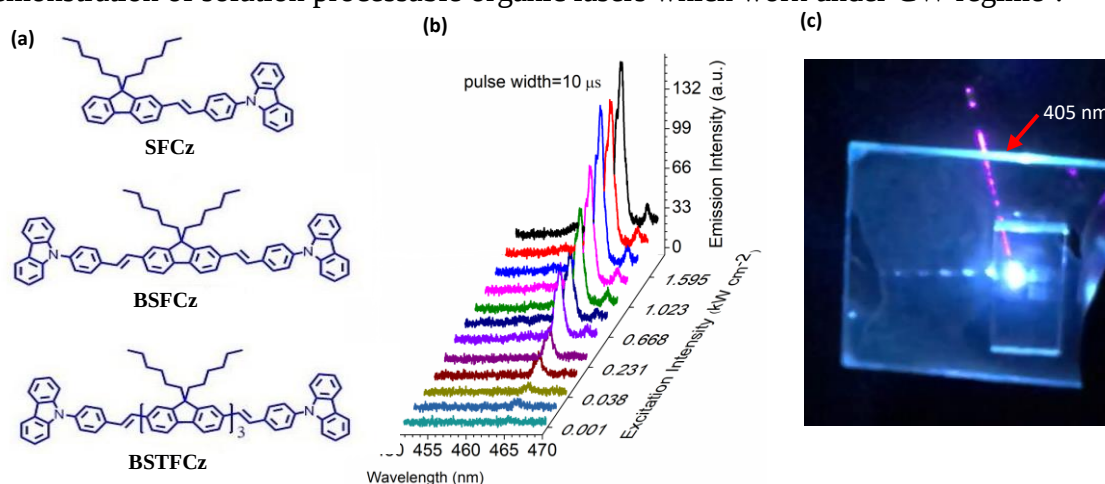


Figure 1: (a) Molecular structures of SFCz, BSFCz, and BSTFCz. (b) CW laser emission of BSFCz blend films under 10 μs pulse width with a second order grating structure. (c) Photograph of the DFB device operating under CW lasing.

1. A. S. D. Sandanayaka *et al. Sci. Adv.* **2017**, 3, e1602570.