Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C

Supporting Information

Synthesis and Two-photon Properties of A Novel Multi-branched Chromophore with Unsymmetrically Substituted Scaffold Derived from Functionalized Quinoxalinoid Heterocycles

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♦ Representative Numbering of C and H on Various Structural Units

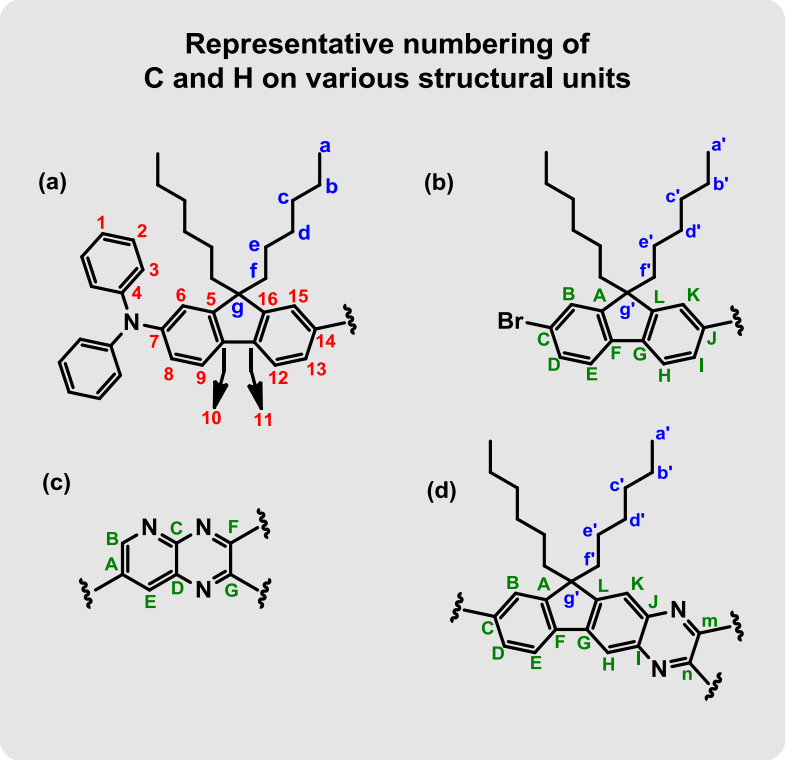

Figure S1. Representative numbering of C and H on different structural units.

♦ Photophysical Methods

Linear absorption and emission spectra measurements

Linear absorption spectra were recorded on a Shimadzu 3150 PC spectrophotometer with freshly prepared sample solutions in various solvents (1×10^{-5}M). The same sample solutions were also used for the measurement of one-photon-induced fluorescence emission spectra and life-time by utilizing a Jobin-Yvon FluoroMax-4 spectrometer equipped with TCSPC accessories (FluoroHub-B + NanoLED from Jobin-Yvon). The aforementioned fluorospectrometer equipped with an integrated sphere (Labsphere from Jobin-Yvon; diameter = 100mm) was also employed to measure the absolute fluorescence quantum yield of each model compound in solution phase (1×10^{-5}M) at room temperature;[1] Coumarin 153 (Φ_F = 0.38±5% at λ_{exc} = 423 nm) was used as the standard for the calibration of the integrated sphere and the instrument.[2, 3]

Two-photon-excited fluorescence (2PEF) measurements

Two-photon-excited fluorescence spectra of the studied model fluorophores in solution phase (concentration: 1×10^{-4}M) were measured according to the protocol established by Xu and Webb using Fluorescein (0.1N NaOH solution) as the standard.[4] The experimental setup is illustrated in Figure S1. In brief, the excitation light source was a mode-locked Ti:Sapphire laser (Tsunami pumped with a Millennia 10W, Spectra-Physics) which delivers ~80fs pulses with the repetition rate of 80MHz and the beam diameter of 2mm. The intensity level of the excitation beam was carefully controlled by a λ/2 wave plate in order to avoid the saturation of absorption and photodegradation. To minimize the effects of re-absorption, the excitation beam was focused as close as possible to the wall of the quartz cell (10mm×10mm cuvette) and the 2PEF emissions were collected and induced by a fiber bundle into a CCD imaging spectrometer (USB-4000, Ocean Optics) for the spectra recording. This optical system was also utilized for the characterization of the quadratic dependence of the 2PA-induced up-conversion emission intensity on the pumpimg intensity for every data point.

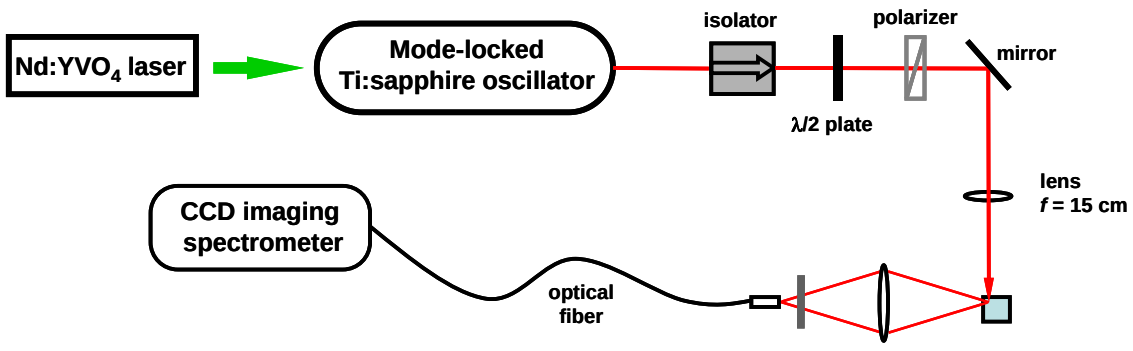

Figure S2. Optical setup for 2PEF-related experiments.

Effective optical-power limiting property studies

Effective optical-power limiting performance of compounds **1**-**4** in solution phase (0.02M in THF, light path-length = 1 cm) was probed at ~800nm using nanosecond laser pulses as the working tool. As shown in Figure S2, a nanosecond tunable laser system (an integrated OPO and Q-switched Nd:YAG laser: NT 342/3 from Ekspla) were employed as the excitation source to provide ~6 ns laser pulses with repetition rate of 10 Hz for this study. The laser beam was slightly focused onto the center of the sample solution in order to obtain a nearly uniform laser beam radius within the whole cell path-length. The local intensity within the sample solution was tuned by adjusting the incident laser power level with the aid of a ND filter set. In all cases, the energy of transmitted laser beam from the sample cell was detected by an optical power (energy) meter with a large detection area of ~25 mm in diameter.

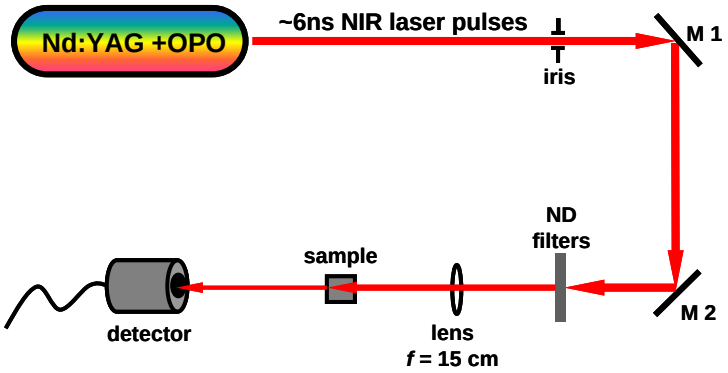

Figure S3. Experimental setup for the effective optical power limiting behavior studies.

References

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