Electronic Supplementary Material (ESI) for Journal of Materials Chemistry

A novel carbazole-based dye outperformed the benchmark dye N719 for high efficiency dye-sensitized solar cells (DSSCs)

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Supporting Information and Experimental Section

1.1. Analytical Measurements

1.1.1. UV-Vis absorption of NCSU-10, NCSU-10', and N719 adsorbed on TiO_2

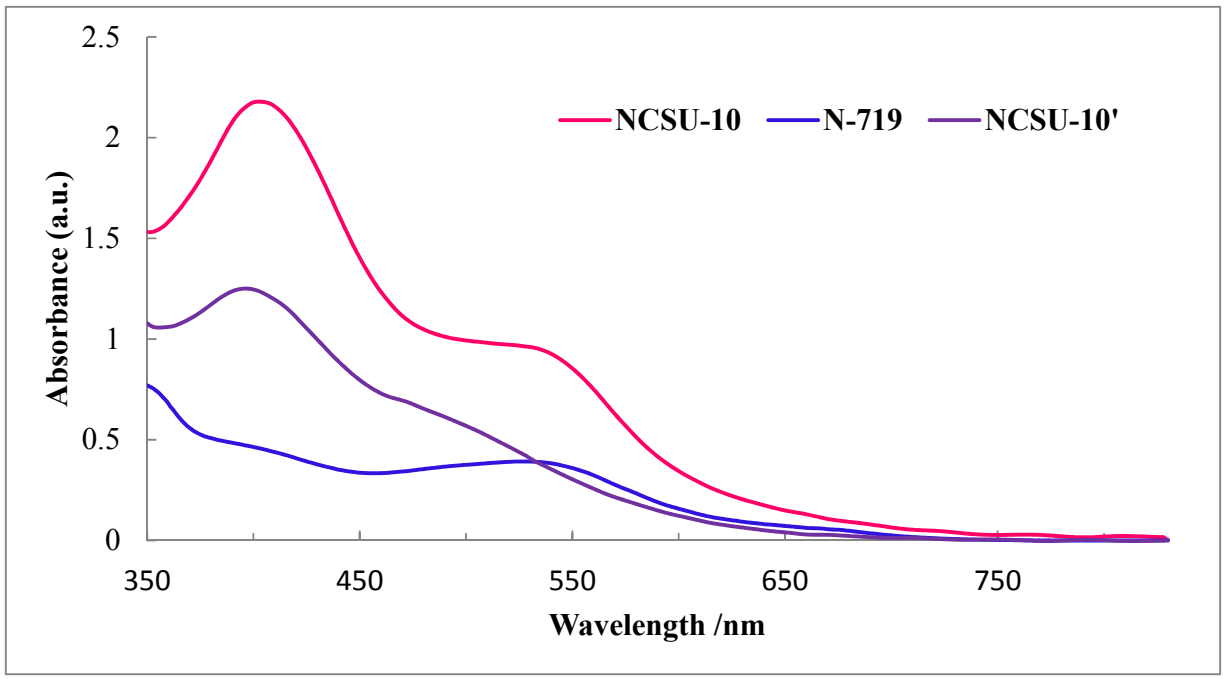

Figure S1 Absorption spectrum of NCSU-10, NCSU-10', and N719 adsorbed on TiO_2.

1.1.2. Fluorescence Spectra and time-resolved photoluminescence spectroscopy

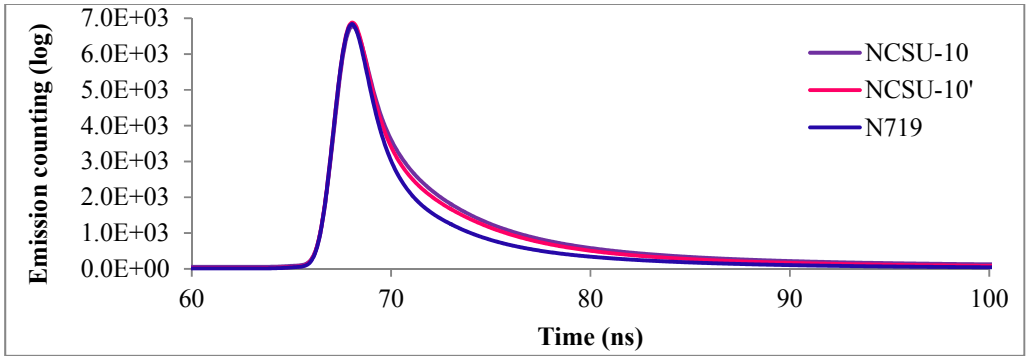

Figure S2 Time-resolved emission decays for NCSU-10, NCSU-10', and N719 measured in DMF.

1.1.3. Infra Red Spectroscopy

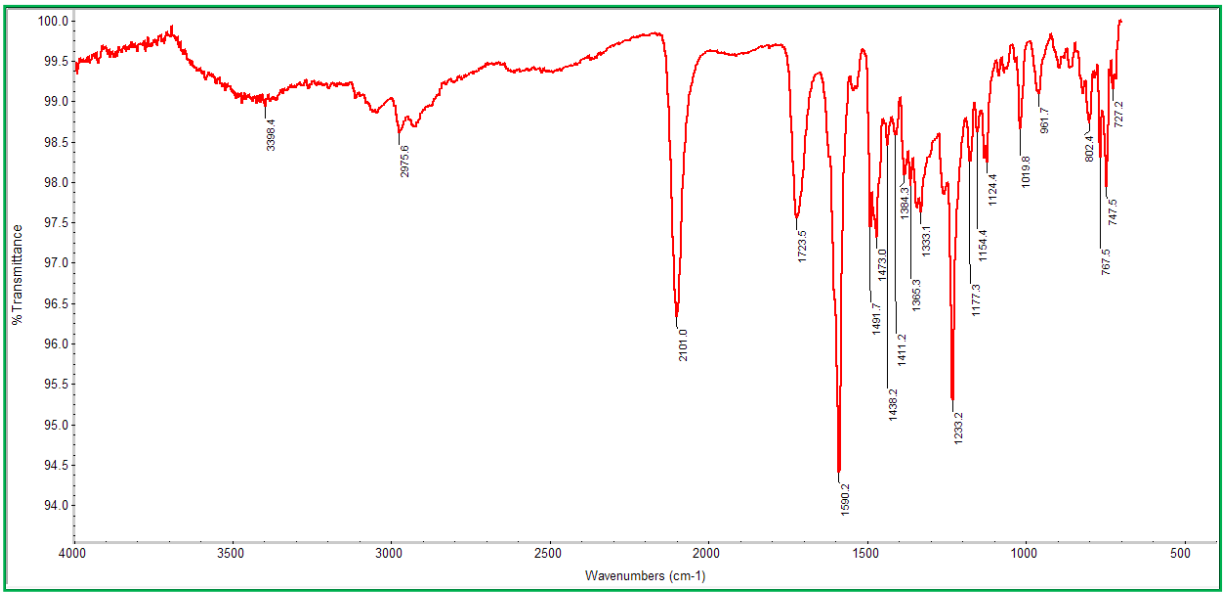

Figure S3 FT-IR of the pure form of NCSU-10.

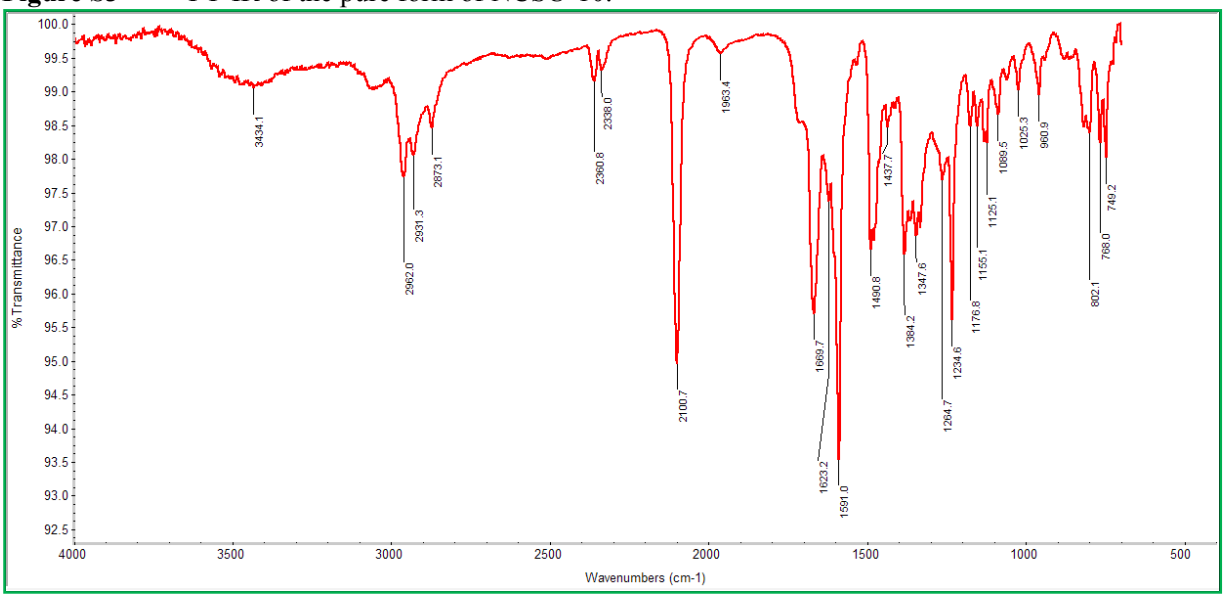

Figure S4 FT-IR of the pure form of NCSU-10'.

1.1.4. Mass Spectrometry

ESI mass spectrum of **NCSU-10**, Mass 1056.18139; $[M-2H + TBA]^{-1}$; Theo. m/z = 1296.4505, found. m/z 1296.4571, Error = 5.00 ppm.
ESI mass spectrum of **NCSU-10'**, Mass 1056.18139; $[M-2H + TBA]^{-1}$; Theo. m/z = 1296.4505, Found. m/z = 1296.4505, Error = 0.00 ppm.

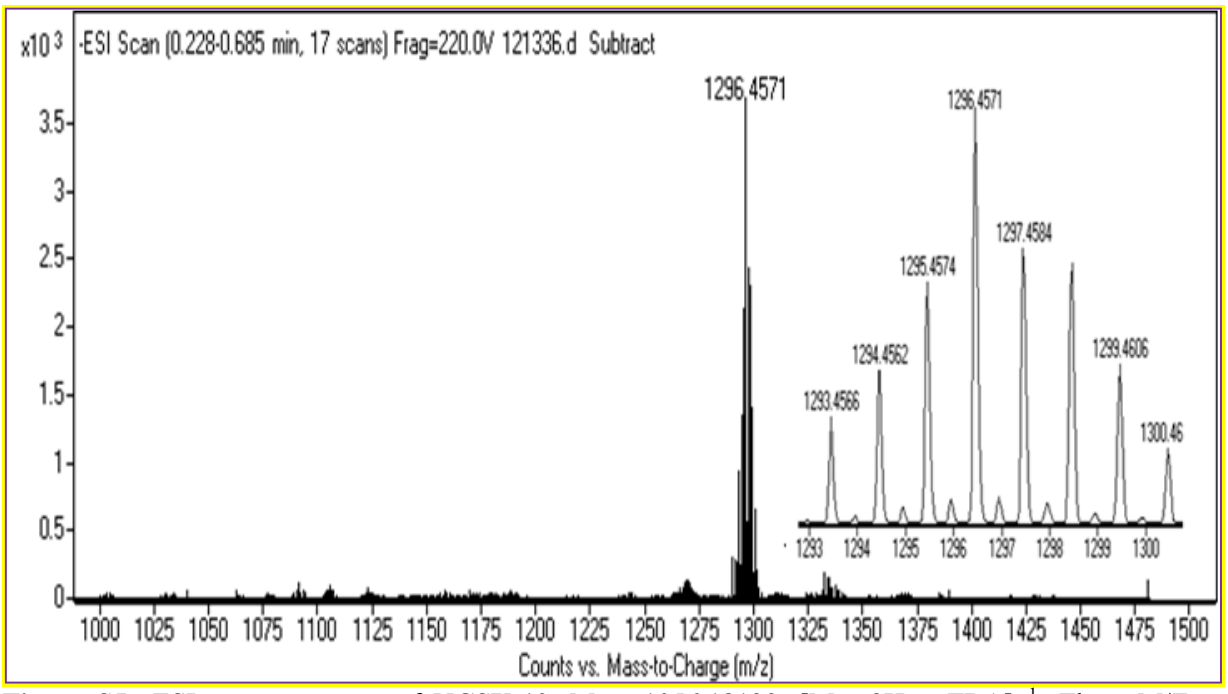

Figure S5 ESI mass spectrum of **NCSU-10**, Mass 1056.18139; $[M - 2H + TBA]^{-1}$; Theo. M/Z = 1296.4505, Found. M/Z = 1296.4571, Error = 5.09 ppm.

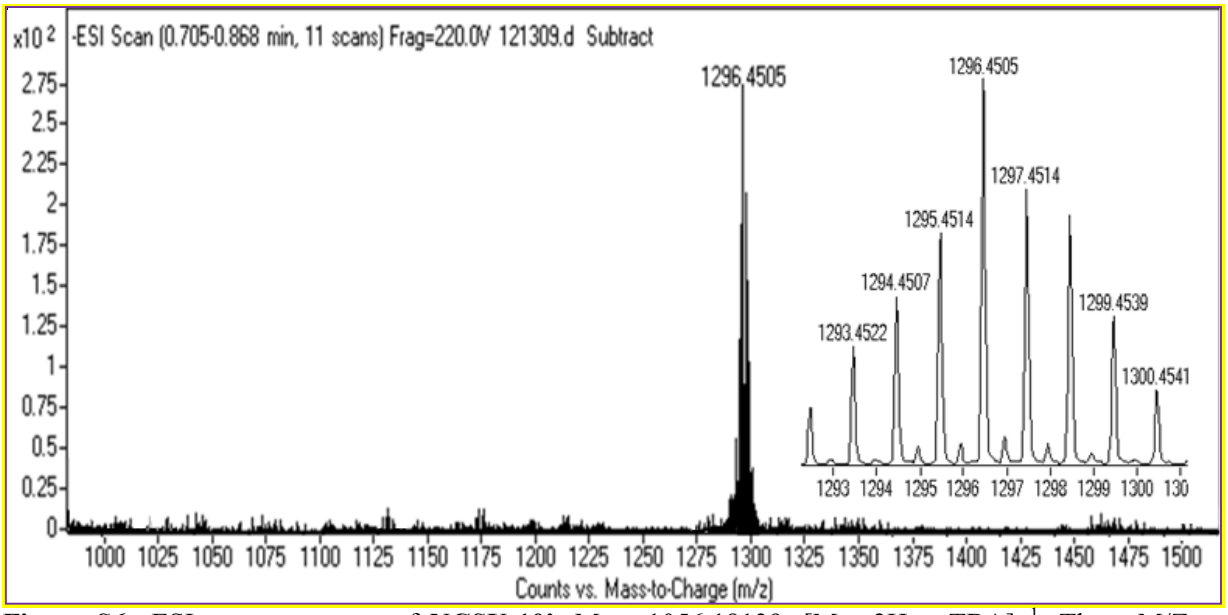

Figure S6 ESI mass spectrum of **NCSU-10'**, Mass 1056.18139; $[M - 2H + TBA]^{-1}$; Theo. M/Z = 1296.4505, Found. M/Z = 1296.4505, Error = 0.00 ppm.

1.1.5. Temperature Dependent ^{1}H-NMR Experiments

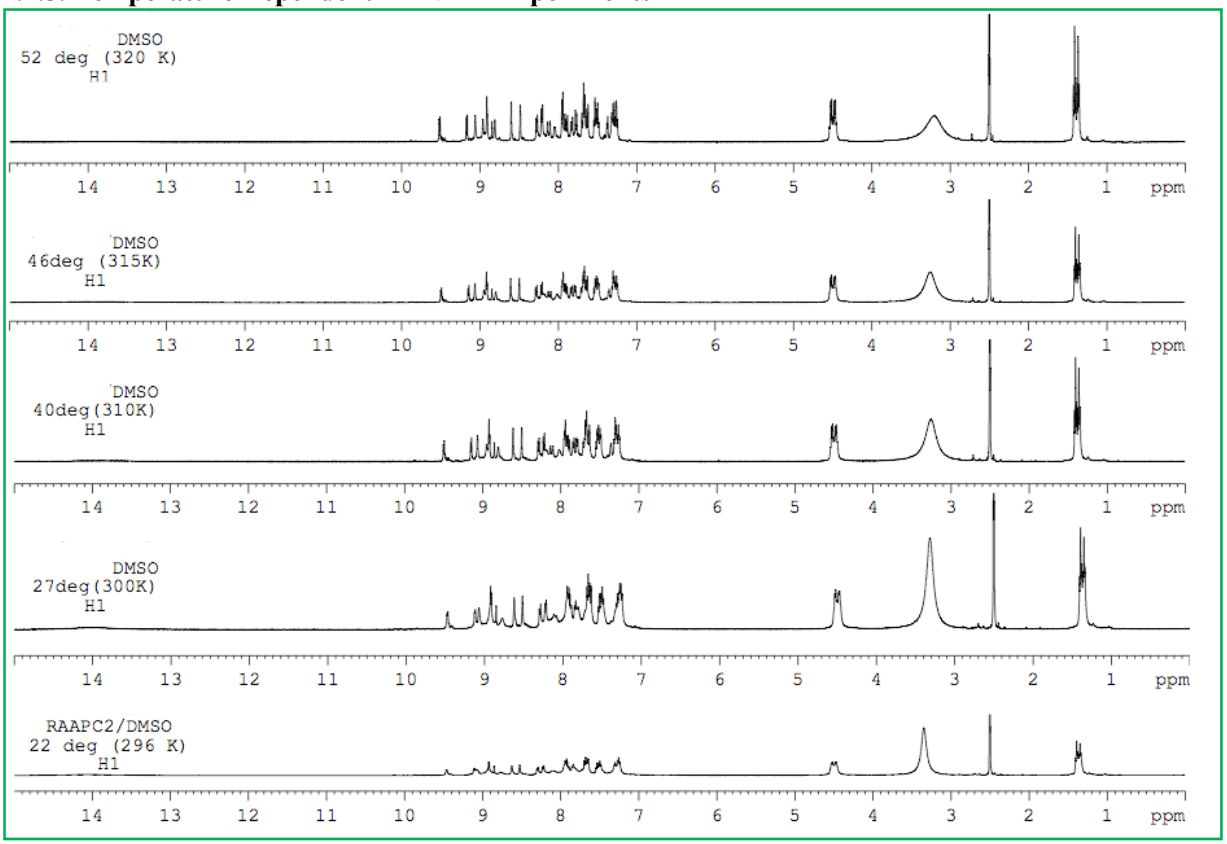

Figure S7 Temperature dependent ^{1}H-NMR for NCSU-10.

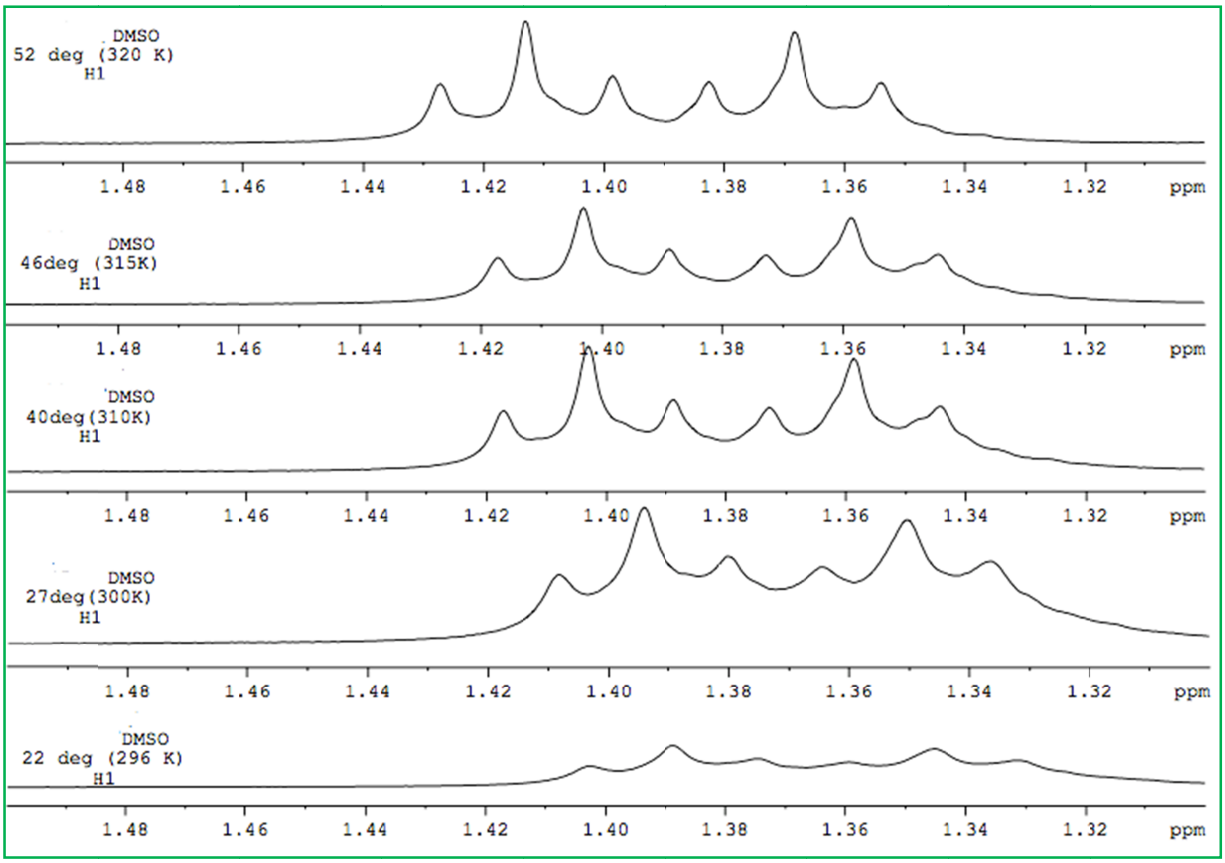

Figure S8 Zoom-in on the 2 CH_3, showing two triplets well resolved at 52 °C, for NCSU-10.

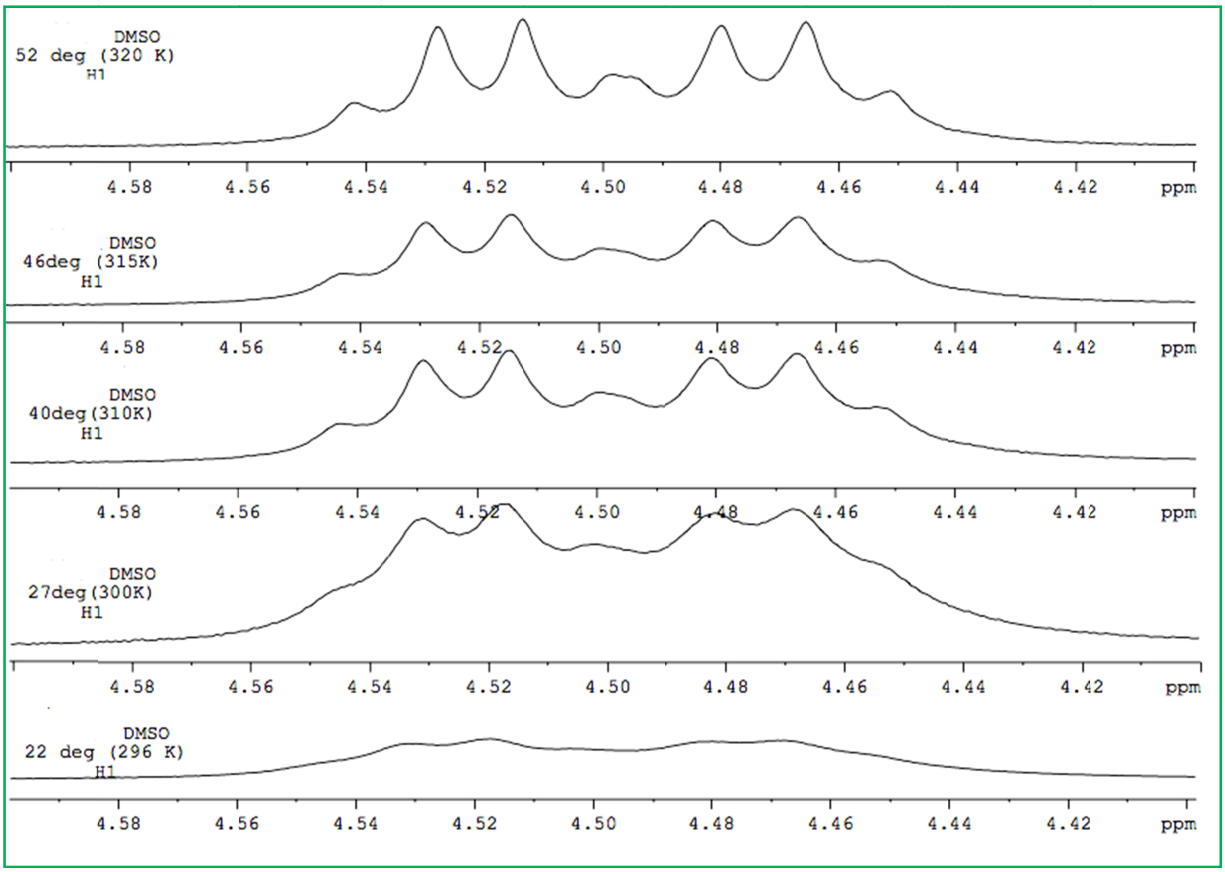

Figure S9 Zoom-in on the 2 CH_2, showing two quartets well resolved at 52 °C, for NCSU-10.

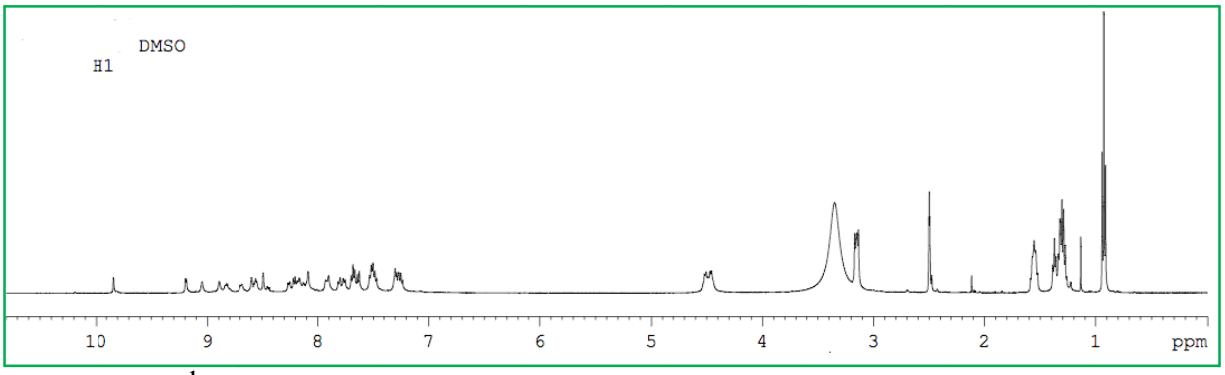

Figure S10 ^{1}H-NMR of NCSU-10'.

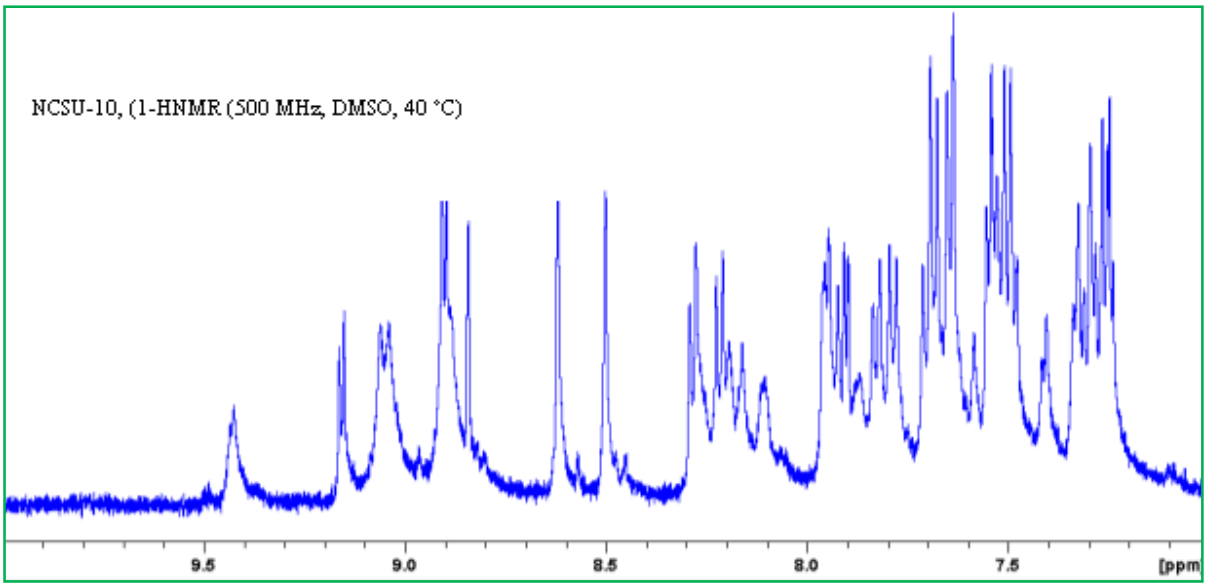

Figure S11 Zoom-in on the aromatic region of NCSU-10.

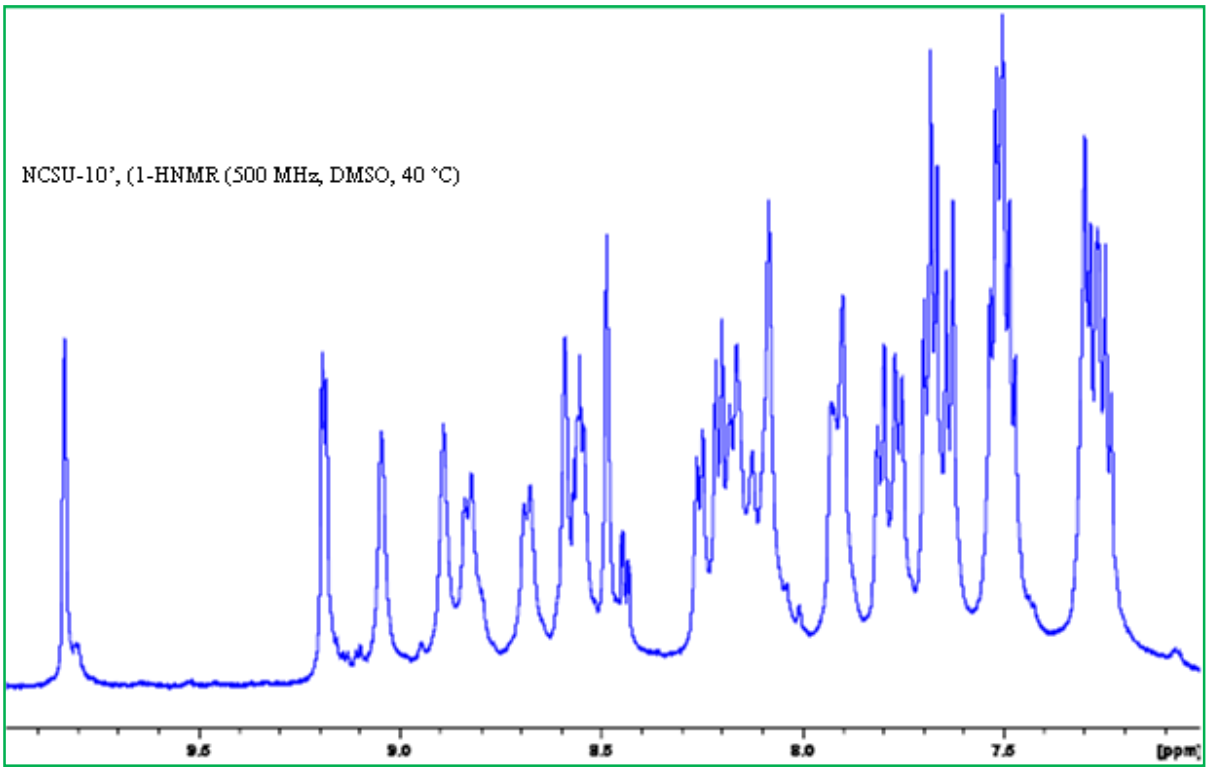

Figure S12 Zoom-in on the aromatic region of NCSU-10'.

1.2. Photoemission Yield Spectrometer (AC3) and E_{0-0} Measurements

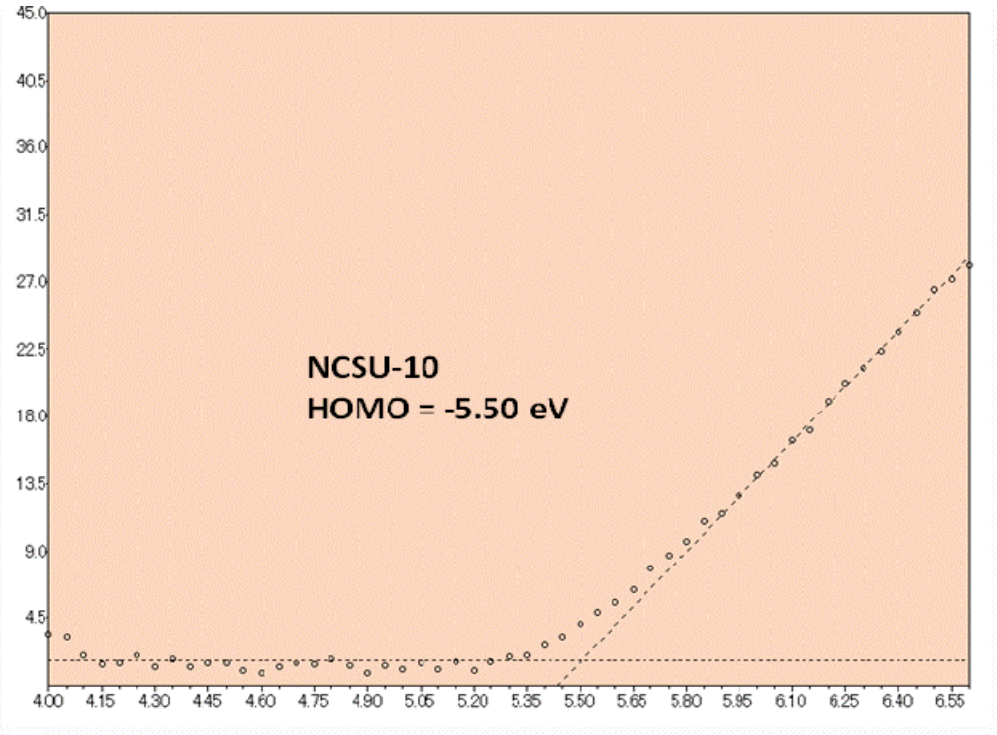

Figure S13 HOMO energy value of NCSU-10.

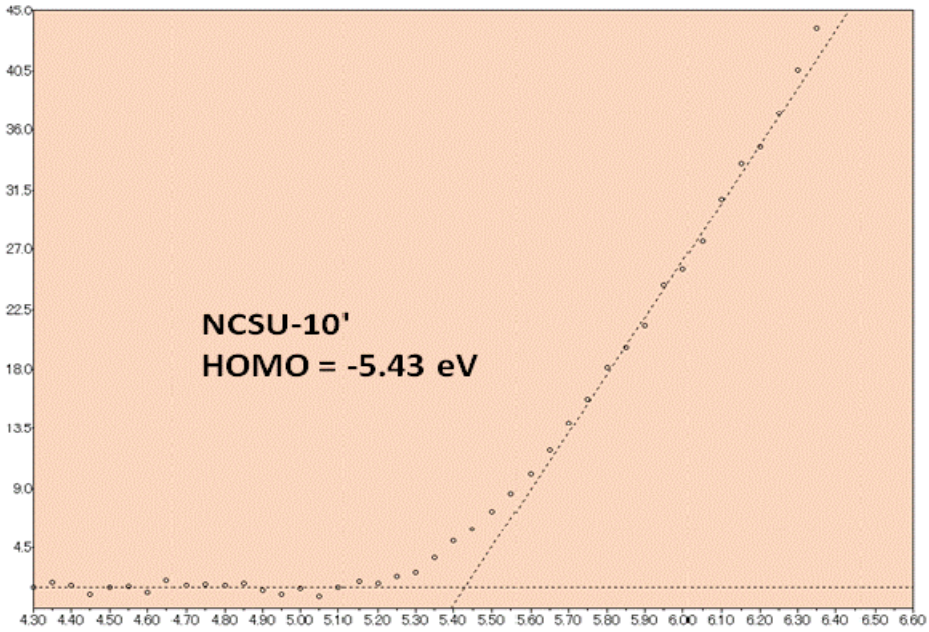

Figure S14 HOMO energy value of NCSU-10'

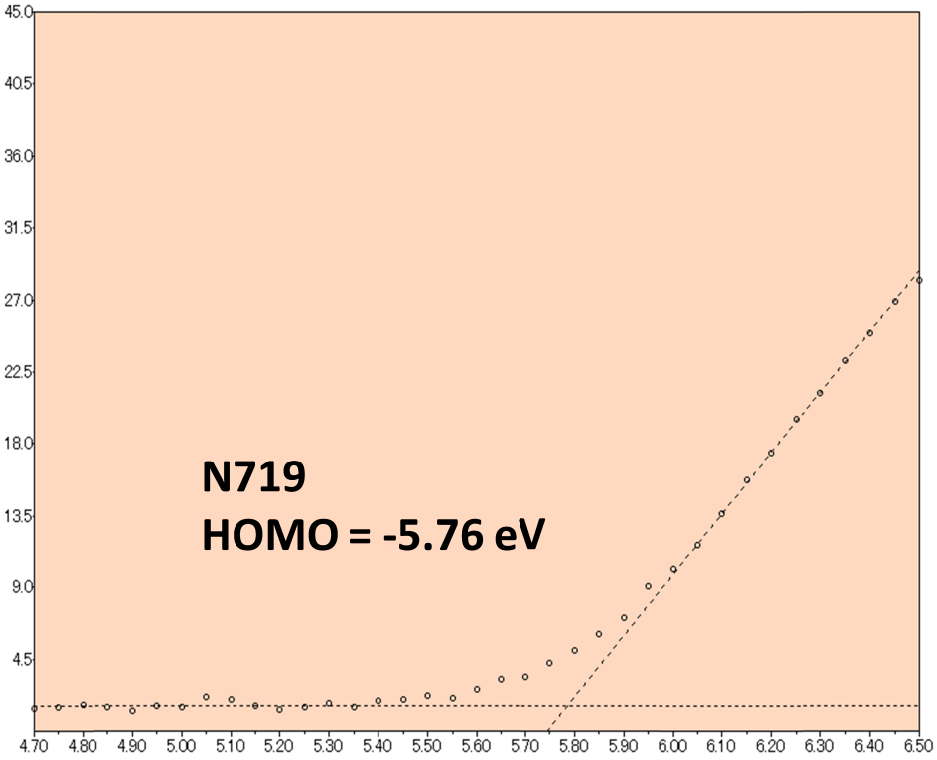

Figure S15 HOMO energy value of **N719**.