

Supporting Information

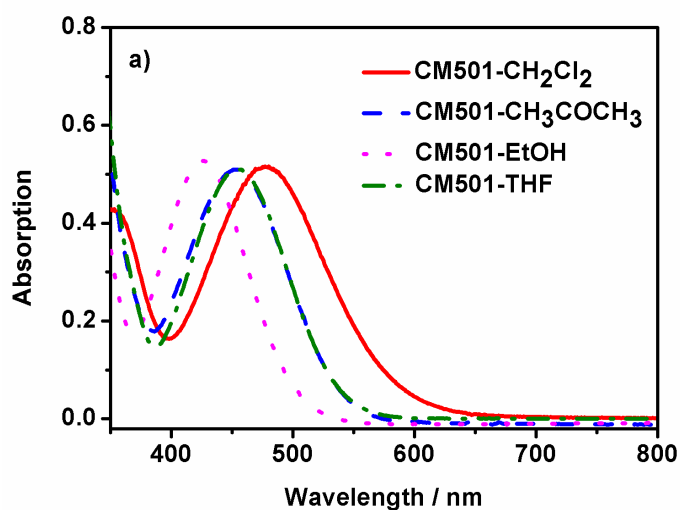
Effect of the Acceptor on Performance of Dye-Sensitized Solar Cells

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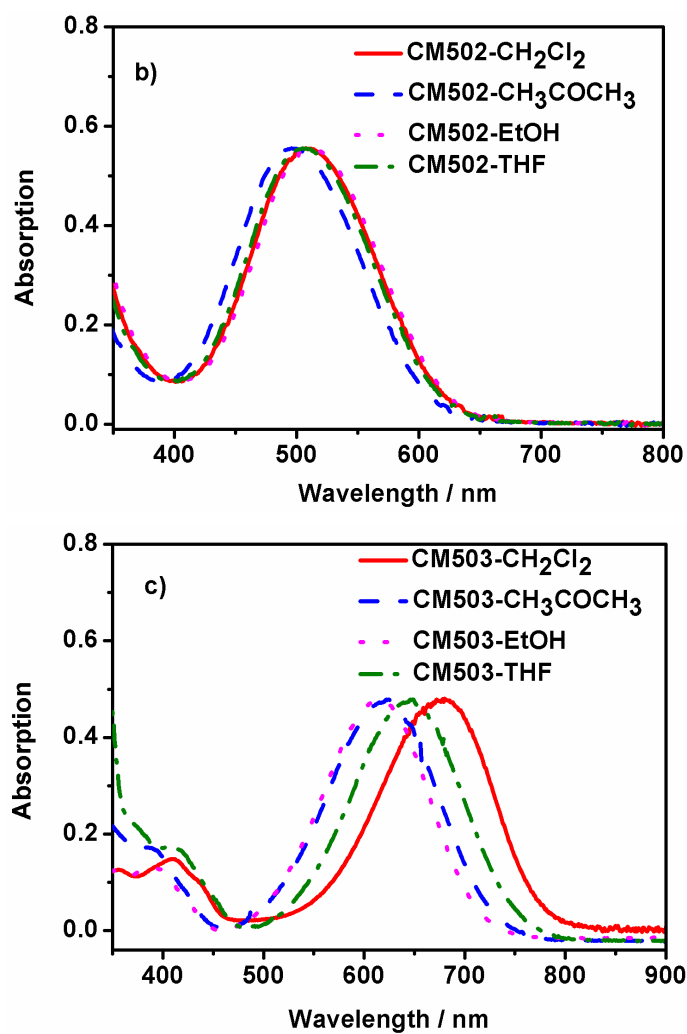


Figure S1 The absorption spectra of the dyes CM501-CM503 in different solvents

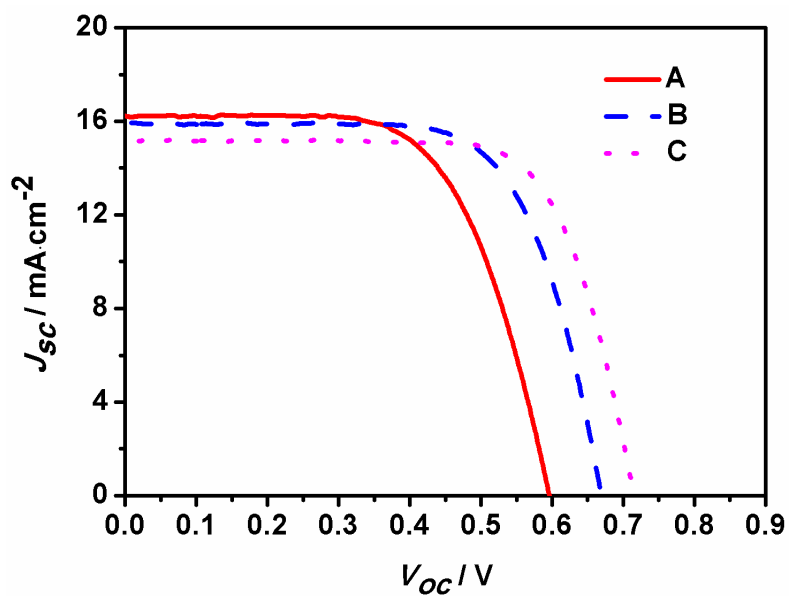
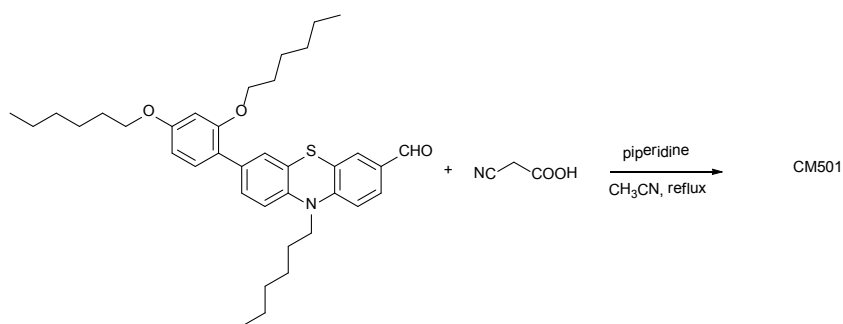
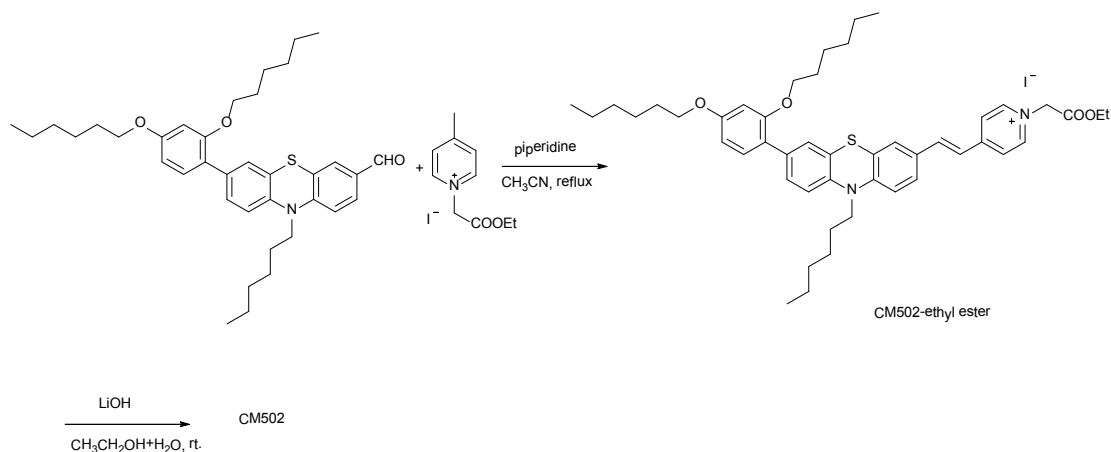


Figure S2 $J-V$ curves of DSSCs sensitized by N719



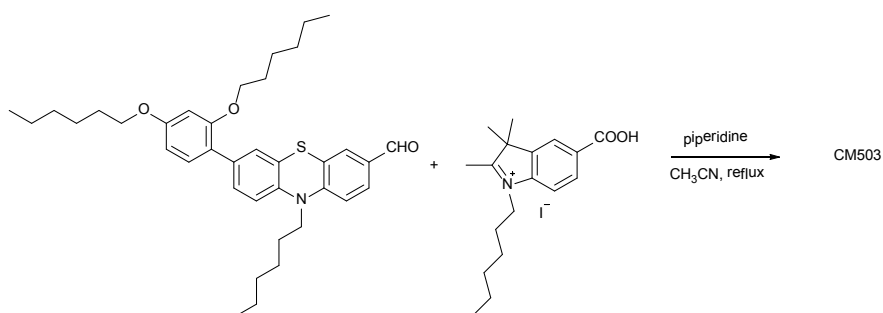
7-(2,4-bis(hexyloxy)phenyl)-10-hexyl-3-formyl-phenothiazine (587 mg, 1 mmol) and cyanoacetic acid (105 mg, 1.2 mmol) were added into CH₃CN(30 mL) and refluxed for 12 h, with piperidine as the catalyst. Then remove the solvent by rotary evaporation and the residue was purified by chromatography (silica gel, dichloromethane: methanol=10:1) to provide **CM501**. ¹H NMR (400 MHz, Acetone) δ 7.40 (s, 1H), 7.33 (d, *J* = 1.9 Hz, 2H), 7.20 (d, *J* = 8.4 Hz, 1H), 7.16 (dd, *J* = 7.7, 6.2 Hz, 1H), 7.12 (s, 1H), 7.03 – 6.97 (m, 2H), 6.60 (d, *J* = 2.3 Hz, 1H), 6.55 (dd, *J* = 8.4, 2.3 Hz, 1H), 4.05 – 3.89 (m, 6H), 1.84 – 1.65 (m, 6H), 1.53 – 1.39 (m, 6H), 1.39 – 1.23 (m, 12H), 0.96 – 0.81 (m, 9H); TOF MS ES: Found *m/z* 654.3498, Calc. for C₄₀H₅₀N₂O₄S 654.3491. Elemental Analysis: C: 73.42%; H: 7.76%; N: 4.23%; O: 9.71%; S: 4.93%



7-(2,4-bis(hexyloxy)phenyl)-10-hexyl-3-formyl-phenothiazine (587 mg, 1 mmol) and 1-(2-ethoxy-2-oxoethyl)-4-methylpyridin-1-ium (220 mg, 1.2 mmol) were added into CH₃CN(30 mL) and refluxed for 12 h, with piperidine as the catalyst. Then remove the solvent by rotary evaporation and the residue was purified by chromatography (silica gel, dichloromethane: methanol=10:1) to provide **CM502-ethyl ester**. ¹H NMR (400 MHz, Acetone) δ 8.53 (d, *J* = 6.6 Hz, 2H), 8.24 (d, *J* = 6.9 Hz, 2H), 7.36 (s, 1H), 7.31 (d, *J* = 1.9 Hz, 2H), 7.20 (m, 2H), 7.16 – 6.97 (m, 4H), 6.60 (d, *J* = 2.3 Hz, 1H), 6.55 (dd, *J* = 8.4, 2.3 Hz, 1H), 4.37 (q, *J* = 7.1 Hz, 2H), 4.05 –

3.89 (m, 6H), 1.84 – 1.65 (m, 6H), 1.53 – 1.39 (m, 6H), 1.39 – 1.23 (m, 15H), 0.96 – 0.81 (m, 11H); TOF MS ES: Found m/z 749.4347, Calc. for $C_{47}H_{61}N_2O_4S^+$ 749.4353.

To the solution of **CM502-ethyl ester** (750 mg 1mmol) in ethanol, $LiOH \cdot H_2O$ (419mg, 10mmol) was added, stirred at room temperature for 10h. Then remove the solvent by rotary evaporation and the residue was purified by chromatography (silica gel, dichloromethane: methanol=5:1) to provide product **CM502**. 1H NMR (400 MHz, Acetone) δ 8.63 (d, $J = 6.6$ Hz, 2H), 8.44 (d, $J = 6.9$ Hz, 2H), 7.38 (s, 1H), 7.31 (d, $J = 1.9$ Hz, 2H), 7.24 (m, 2H), 7.16 – 6.97 (m, 4H), 6.68 (d, $J = 2.3$ Hz, 1H), 6.59 (dd, $J = 8.4, 2.3$ Hz, 1H), 4.44 (q, $J = 7.1$ Hz, 2H), 4.08 – 3.92 (m, 6H), 1.88 – 1.69 (m, 6H), 1.58 – 1.42 (m, 6H), 1.37 – 1.20 (m, 12H), 0.96 – 0.81 (m, 9H); TOF MS ES: Found m/z 749.4032, Calc. for $C_{45}H_{57}N_2O_4S^+$ 721.4039. Elemental Analysis: C: 63.77%; H: 6.80%; I: 14.85%; N: 3.34%; O: 7.53%; S: 3.81%.



7-(2,4-bis(hexyloxy)phenyl)-10-hexyl-3-formyl-phenothiazine (587 mg, 1 mmol) and 5-carboxy-1-hexyl-2,3,3-trimethyl-3H-indolium (350 mg, 1.2 mmol) were added into CH_3CN (30 mL) and refluxed for 12 h, with piperidine as the catalyst. Then remove the solvent by rotary evaporation and the residue was purified by chromatography (silica gel, dichloromethane: methanol=10:1) to provide **CM503**. 1H NMR (400 MHz, Acetone) δ 8.38 (s, 1H), 8.15 (d, 1H), 8.07 (d, 1H), 7.38 (s, 1H), 7.31 (d, $J = 1.9$ Hz, 2H), 7.24 (m, 2H), 7.16 – 6.97 (m, 4H), 6.68 (d, $J = 2.3$ Hz, 1H), 6.59 (dd, $J = 8.4, 2.3$ Hz, 1H), 4.44 (q, $J = 7.1$ Hz, 2H), 4.08 – 3.92 (m, 6H), 1.88 – 1.69 (m, 6H), 1.58 – 1.42 (m, 12H), 1.47 – 1.18 (m, 20H), 0.96 – 0.81 (m, 12H); TOF MS ES: Found m/z 857.5288, Calc. for $C_{55}H_{73}N_2O_4S^+$ 857.5291; Elemental Analysis: C: 67.00%; H: 7.51%; I: 12.96%; N: 2.87%; O: 6.41%; S: 3.22%.