Electronic Supplementary Material (ESI) for Dalton Transactions

Supplementary material for

Ru-Based Donor-Acceptor Photosensitizer that Retards Charge Recombination in a p-type Dye-sensitized Solar Cell

Jonathan C. Freys[a], James M. Gardner[b], Luca DôAmario[a], Allison M. Brown[a] and Leif Hammarström[a]*.

[a] Department of Chemistry, Uppsala University, Uppsala ï 75120, Sweden
E-mail address: leif.hammarstrom@kemi.uu.se ; Tel : +46 18 - 471 3648 ; Fax : 018 - 471 6844.
[b] Department of Chemistry, KTH Royal Institute of Technology, Stockholm ï 10044, Sweden
E-mail address: jgardner@kth.se; Tel : +46 87 908167.

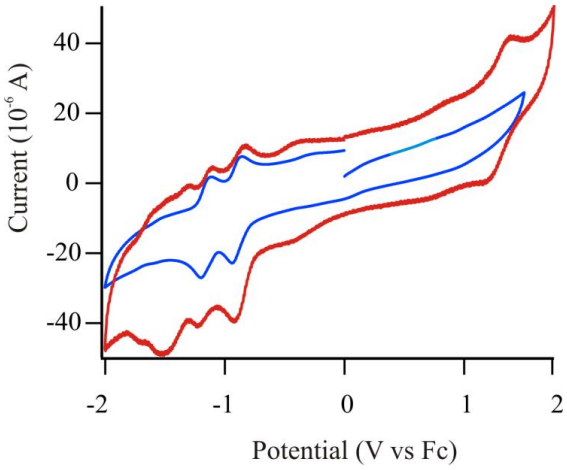

Figure S1 : cyclic voltammograms of NMI (blue line), $[Ru(dcb)_2(NMI\text{-}phen)]$ (red line) in acetonitrile solution with $TBAPF_6$ as supporting electrolyte and all the potentials are referenced relative to Fc/Fc^+.

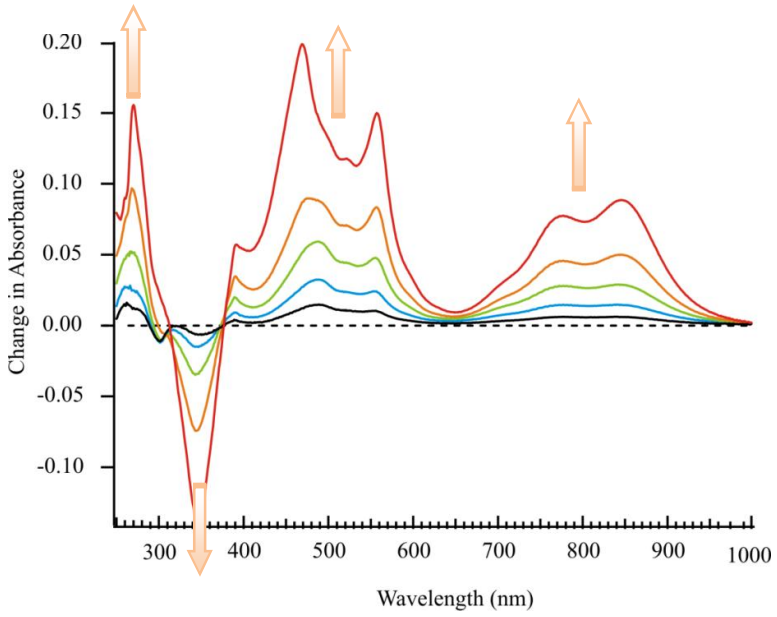

Figure S2 : qabsorption spectra of NMI in one minute intervals with an applied potential of -1.0V in acetonitrile at room temperature.

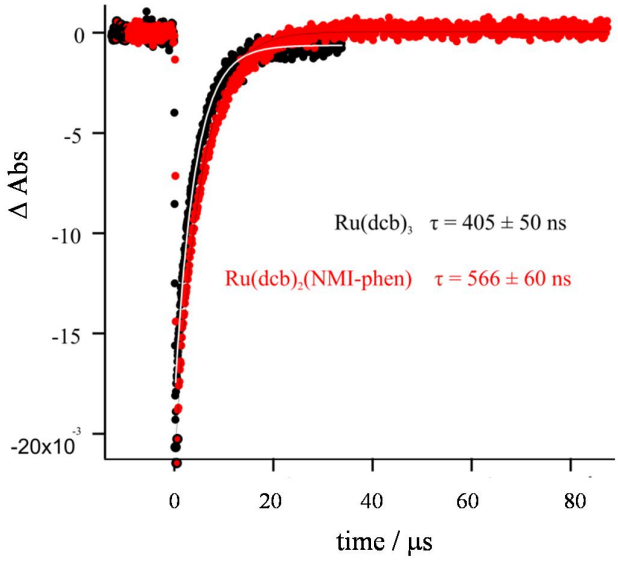

Figure S3 : Excited state lifetime measurements from ground state bleach recovery after excitation at 470 nm in room temperature degassed acetonitrile/water solution for $[Ru(dcb)_3]$ (black dots) and $[Ru(dcb)_2(NMI\text{-}phen)]$ (red dots). The slightly longer excited state lifetime for $[Ru(dcb)_2(NMI\text{-}phen)]^{2+}$ can be attributed to the somewhat different electronic effects of phen and dcb ligands.

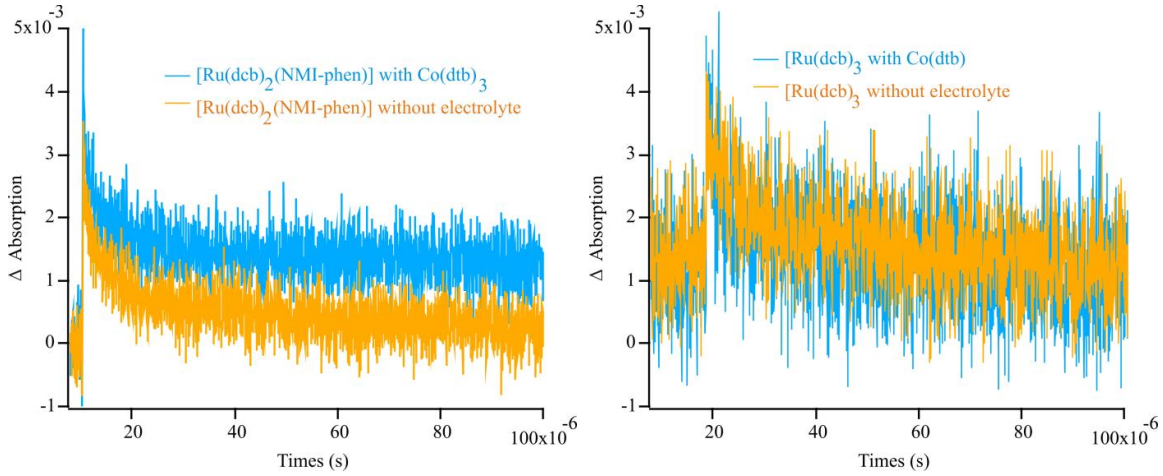

Figure S4 : (left plot) qpAbs kinetics (pump = 460 nm, probe = 510 nm) at room temperature for $[Ru(dcb)_2(NMI\text{-}phen)]^{2+}$ on NiO with (blue) and without (yellow) $Co(dtb)_3$ in acetonitrile. (right plot) qpAbs kinetics excited at (pump = 460 nm, probe = 510 nm) room temperature for $[Ru(dcb)_3]^{2+}$ on NiO with (blue) and without (yellow) $Co(dtb)_3$ in acetonitrile. Parameters for the fits are listed in tables 3 (yellow, without redox active electrolyte) and 4 (blue, with $Co(dtb)_3$).

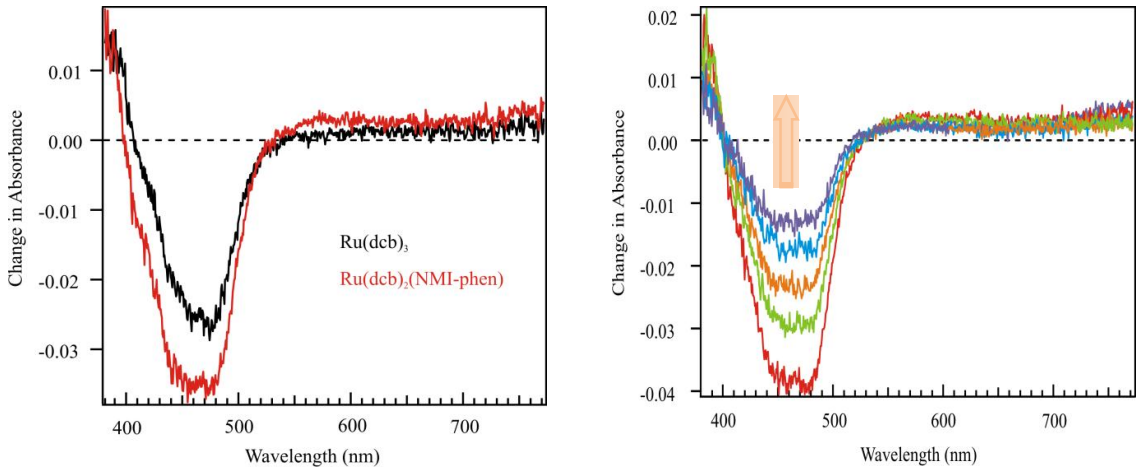

Figure S5 : (left plot) Transient absorption for $[Ru(dcb)_3]^{2+}$ (black line) and $[Ru(dcb)_2(NMI\text{-}phen)]^{2+}$ (red line) 100 ns after excitation at 470 nm in degassed acetonitrile, (right plot) Transient absorption spectra of $[Ru(dcb)_2(NMI\text{-}phen)]$ in a degassed acetonitrile/water solution 100 ns (red), 200 ns (green), 300 ns (orange), 400 ns (blue) and 500 ns (purple) after excitation. In solution, there is no significant difference in behavior between the two complexes and no indication of reduction of the NMI unit in $[Ru(dcb)_2(NMI\text{-}phen)]^{2+}$.

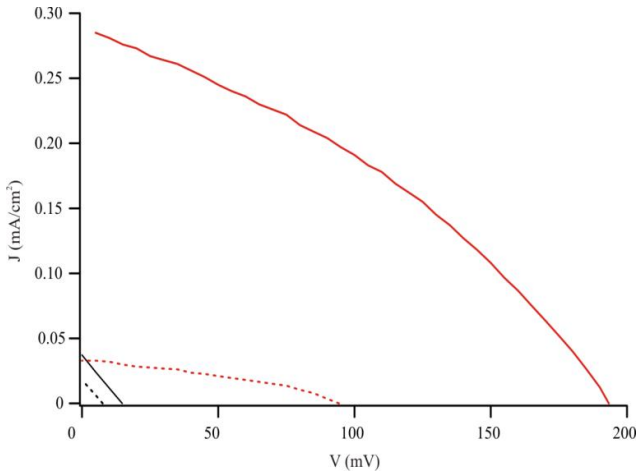

Figure S6 : Currentï voltage characteristics of [Ru(dcb)$_3$] (black line), [Ru(dcb)$_2$(NMI-phen)] (red line) respectively recorded under AM 1.5 (full line) and in the dark (dashed line).