Unlocking the effects of ancillary electron-donors on light absorption and charge recombination in phenanthrocarbazole dye-sensitized solar cells

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**Fig. S1** Wavelength-dependent absorption change upon applying a positive potential bias to a 1.2-μm-thick, dye-grafted titania film immersed in EMITFSI.
Fig. S2 The $^1$H NMR (400 MHz) of 3 in CDCl$_3$. 
Fig. S3 The $^{13}$C NMR (100 MHz) of 3 in CDCl$_3$. 
Fig. S4 The $^1$H NMR (400 MHz) of 4 in CDCl$_3$. 
Fig. S5 The $^{13}$C NMR (100 MHz) of 4 in CDCl$_3$. 
Fig. S6 The $^1$H NMR (400 MHz) of 5 in CDCl$_3$. 
Fig. S7 The $^{13}$C NMR (100 MHz) of 5 in CDCl$_3$. 
Fig. S8 The $^1$H NMR (400 MHz) of 7 in CDCl$_3$. 
Fig. S9 The $^{13}$C NMR (100 MHz) of 7 in CDCl$_3$. 
Fig. S10 The $^1$H NMR (400 MHz) of 8 in CDCl$_3$. 
Fig. S11 The $^{13}$C NMR (100 MHz) of 8 in CDCl$_3$. 
Fig. S12 The $^1$H NMR (400 MHz) of 2 in CDCl$_3$. 
Fig. S13 The $^{13}$C NMR (100 MHz) of 9 in CDCl$_3$. 
Fig. S14 The $^1$H NMR (400 MHz) of HW-1 in THF.
Fig. S15 The $^{13}$C NMR (100 MHz) of HW-1 in THF.
Fig. S16 The $^1$H NMR (400 MHz) of HW-2 in THF.
Fig. S17 The $^{13}$C NMR (100 MHz) of HW-2 in THF.
Fig. S18 The $^1$H NMR (400 MHz) of HW-3 in THF.
Fig. S19 The $^{13}$C NMR (100 MHz) of HW-3 in THF.