Electronic Supplementary Information (ESI)

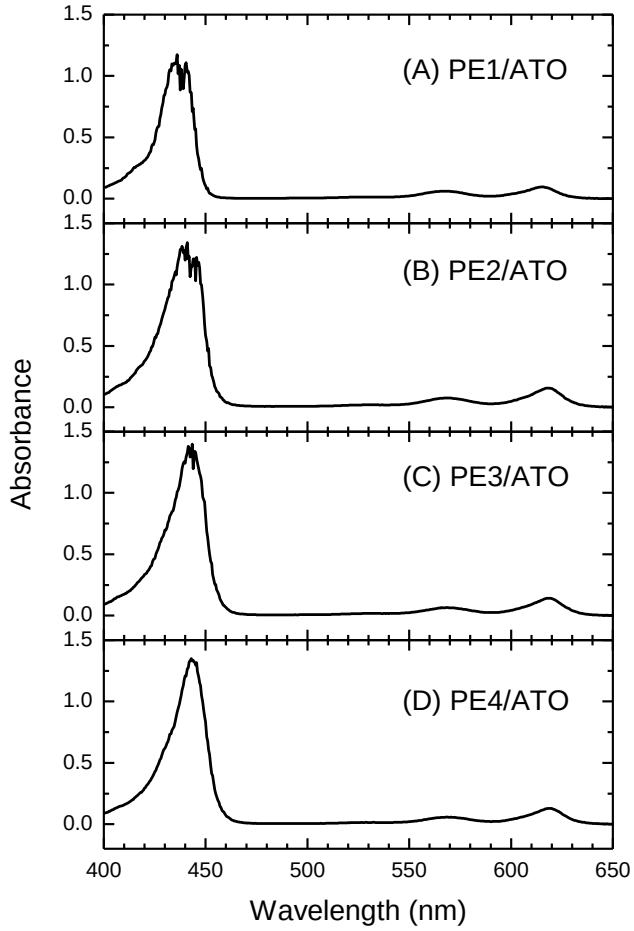

Figure S1: Absorption spectra of ATO NT films sensitized with (A) PE1, (B) PE2, (C) PE3 and (D) PE4. These sensitized films were fabricated into NT-DSSC devices for measurements of photovoltaic curves and photocurrent/photovoltage transients. The amounts of dye loading /nmol cm^{-2} were determined to be 84, 90, 88 and 86 for PE1 -PE4, respectively.

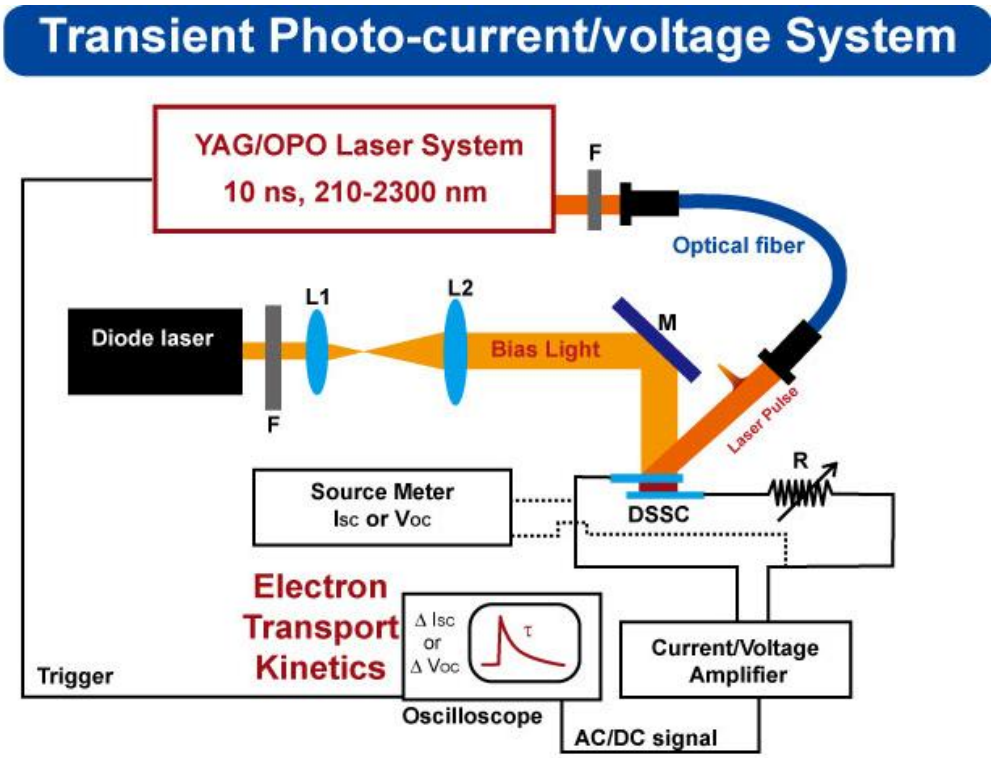

Figure S2: Experimental setup for measurements of photocurrent and photovoltage decays.

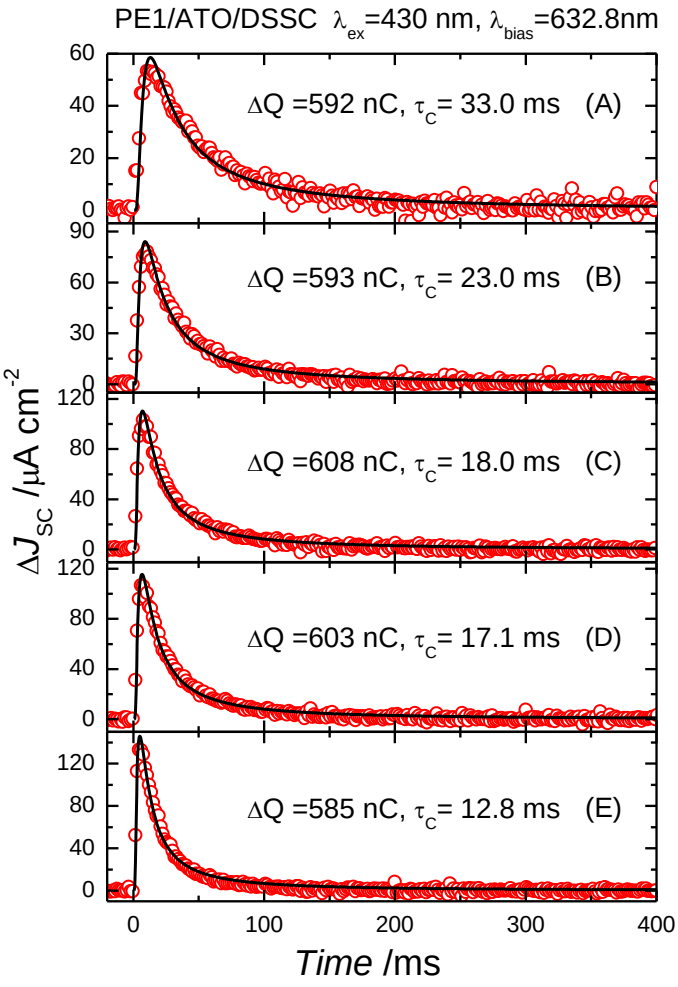

Figure S3: Photocurrent transients of PE1/ATO solar cells obtained at a short-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3 and (E) 11. The transient data (circles) were fitted according to a diffusion kinetic model described in the text. Note that the average value of ΔQ (= 596 nC) was used to evaluate chemical capacitance (C) via the expression $C = \Delta Q/\Delta V$.

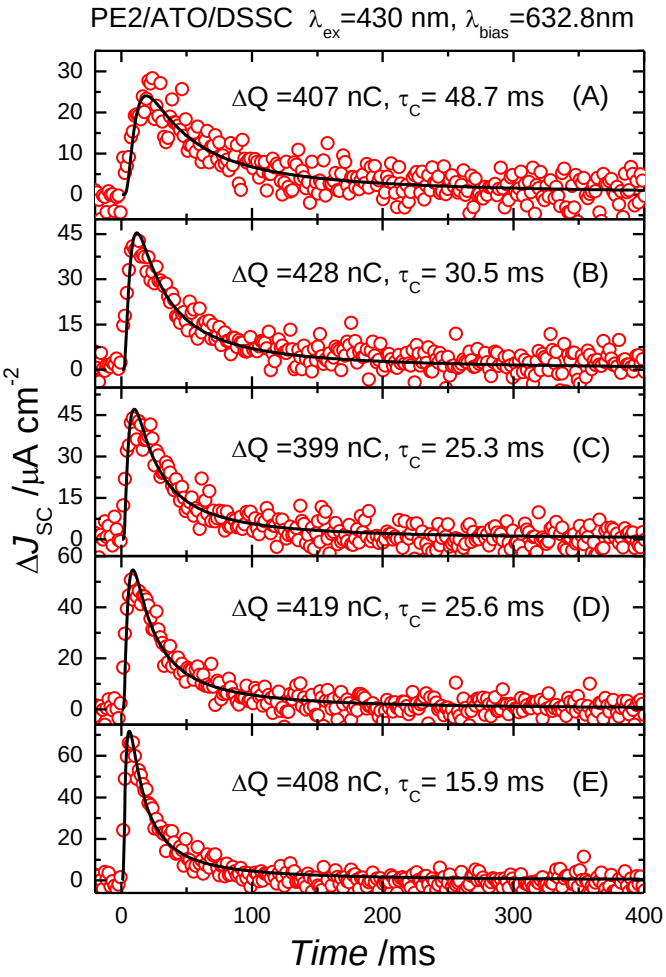

Figure S4: Photocurrent transients of PE2/ATO solar cells obtained at a short-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3 and (E) 11. The transient data (circles) were fitted according to a diffusion kinetic model described in the text. The mean value of ΔQ (= 412 nC) was used to evaluate chemical capacitance (C) from $C = \Delta Q/\Delta V$.

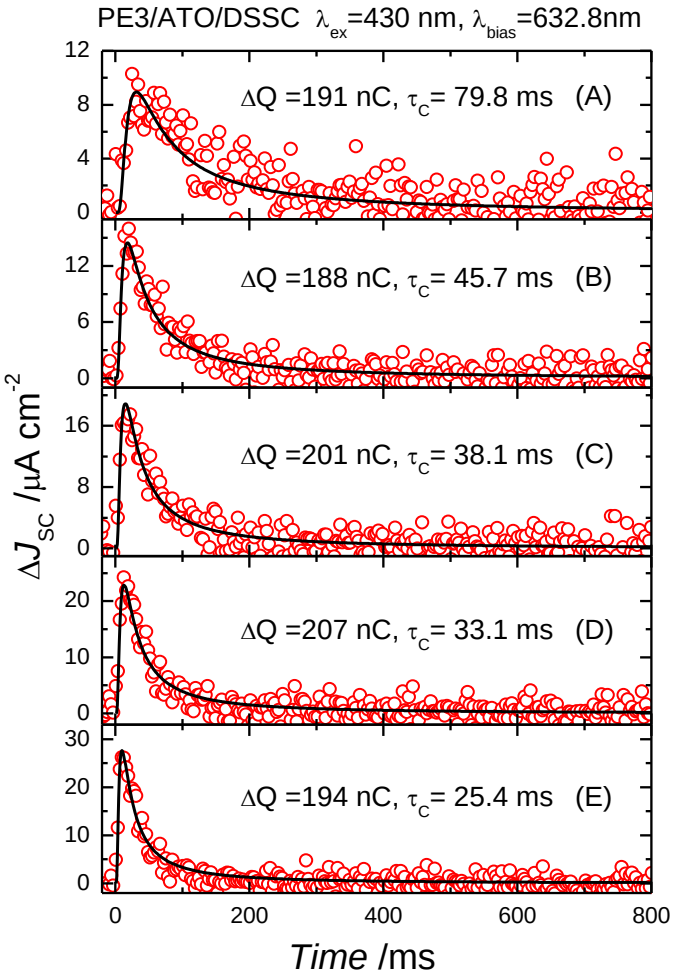

Figure S5: Photocurrent transients of PE3/ATO solar cells obtained at a short-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3 and (E) 11. The transient data (circles) were fitted according to a diffusion kinetic model described in the text. The mean value of ΔQ (= 196 nC) was used to evaluate chemical capacitance (C) from $C = \Delta Q/\Delta V$.

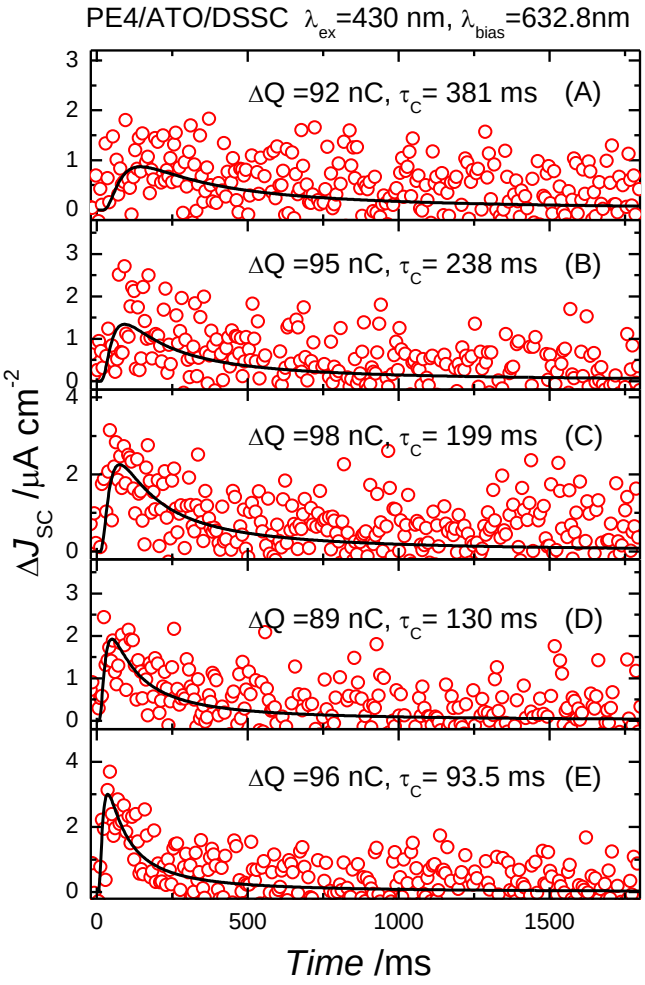

Figure S6: Photocurrent transients of PE4/ATO solar cells obtained at a short-circuit condition with pulse excitation at 430 nm under 632.8-nm bias illumination of photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3 and (E) 11. The transient data (circles) were fitted according to a diffusion kinetic model described in the text. The mean value of ΔQ (= 94 nC) was used to evaluate chemical capacitance (C) from $C = \Delta Q/\Delta V$.

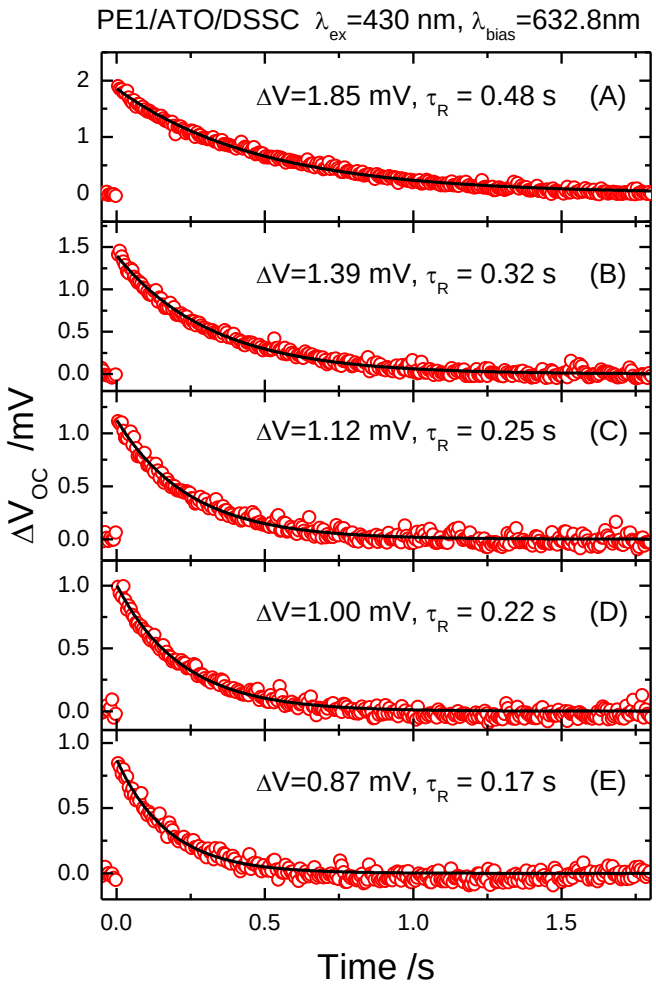

Figure S7: Photovoltage transients of PE1/ATO solar cells obtained at an open-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3, and (E) 11. The transient data (circles) were fitted according to a simple kinetic model described in the text.

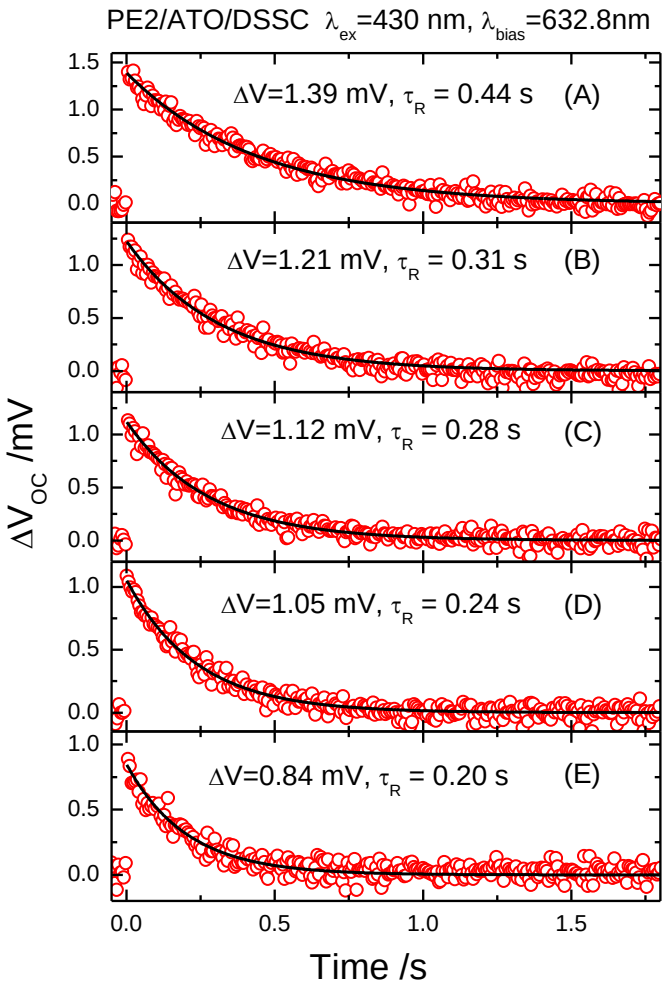

Figure S8: Photovoltage transients of PE2/ATO solar cells obtained at an open-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3, and (E) 11. The transient data (circles) were fitted according to a simple kinetic model described in the text.

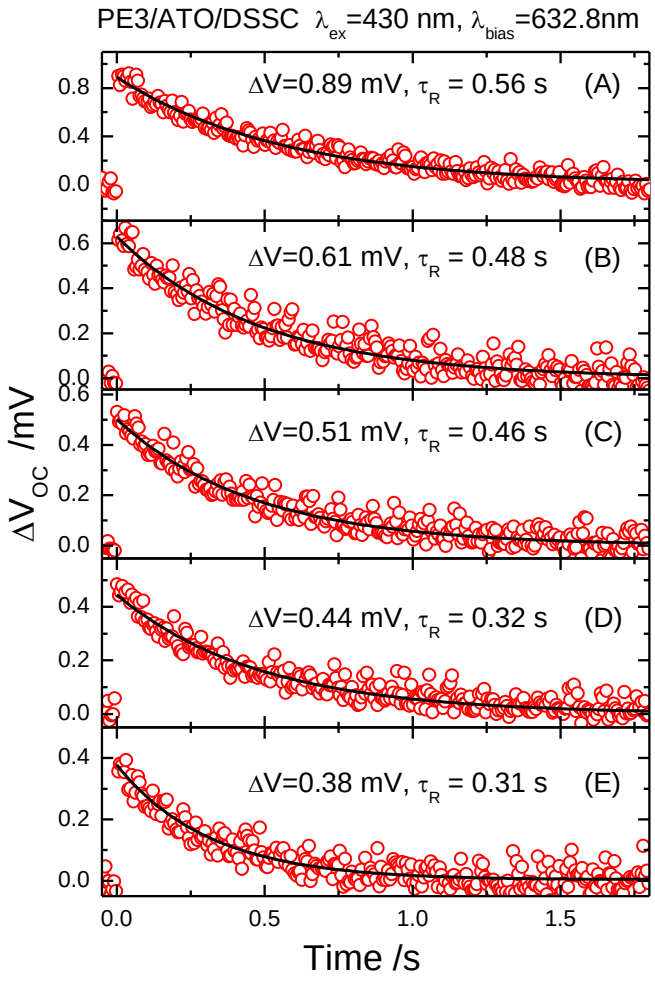

Figure S9: Photovoltage transients of PE3/ATO solar cells obtained at an open-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3, and (E) 11. The transient data (circles) were fitted according to a simple kinetic model described in the text.

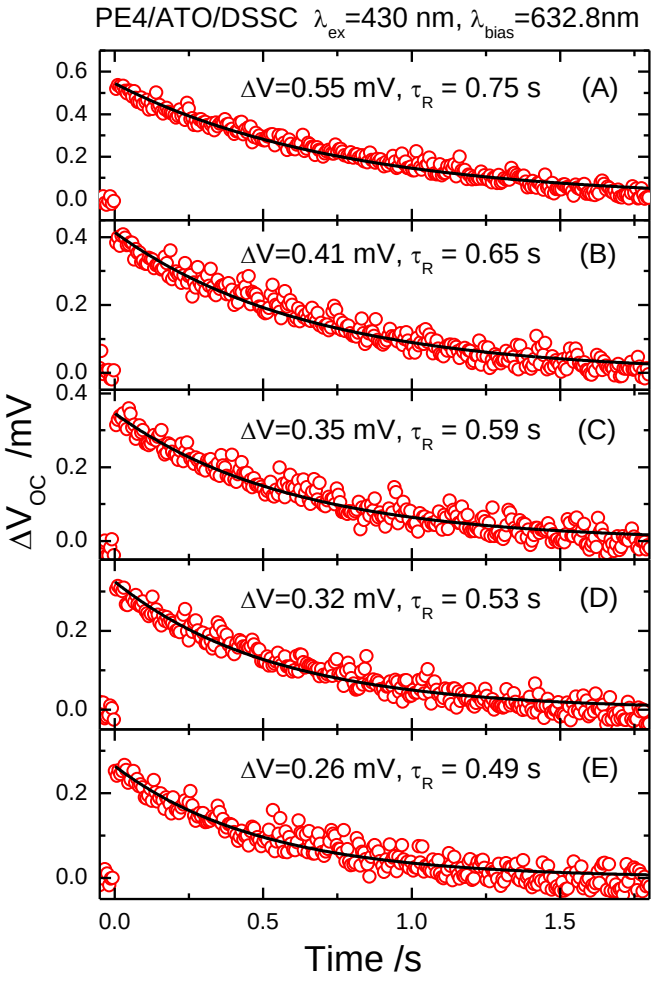

Figure S10: Photovoltage transients of PE4/ATO solar cells obtained at an open-circuit condition with pulse excitation at 430 nm under bias illumination at 632.8 nm for photon fluxes $I_0/10^{15}$ cm^{-2} s^{-1} = (A) 2.2, (B) 4.7, (C) 6.3, (D) 7.3, and (E) 11. The transient data (circles) were fitted according to a simple kinetic model described in the text.