Supporting Information for

Two-dimensional structural ordering in a chromophoric ionic liquid for triplet energy migration-based photon upconversion

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Supporting Figures

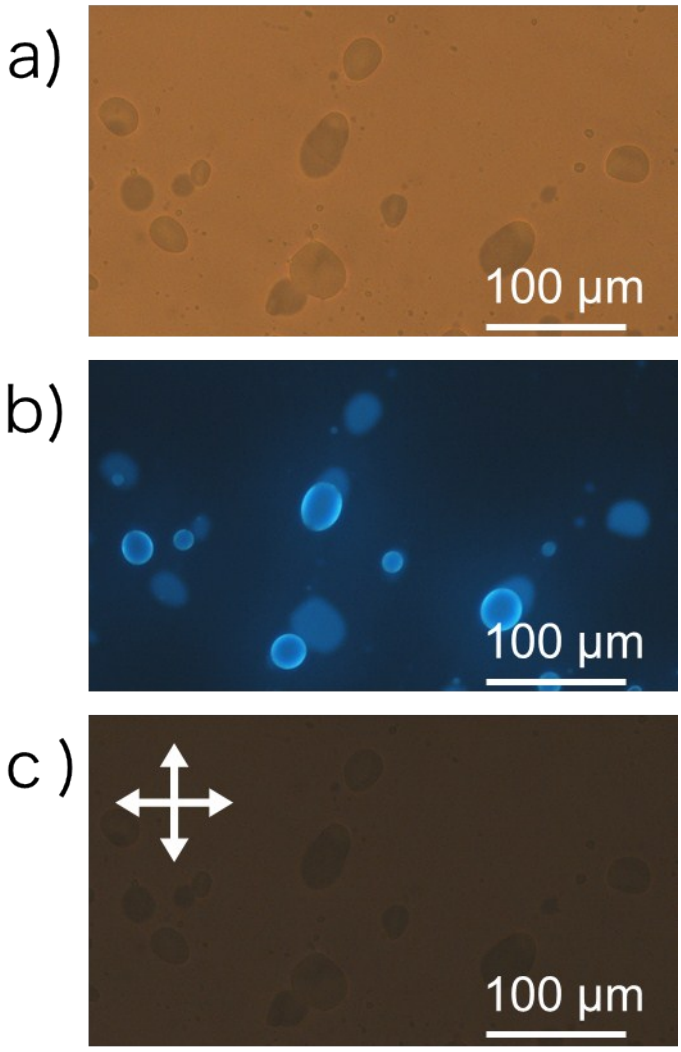

Figure S1. Microscopic images of glassy state of P_{22214}DPAS at 0 °C under (a) white light and (b) UV light (λ_{ex} = 365 nm). (c) Polarized microscopic images of glassy state of P_{22214}DPAS at 0 °C.

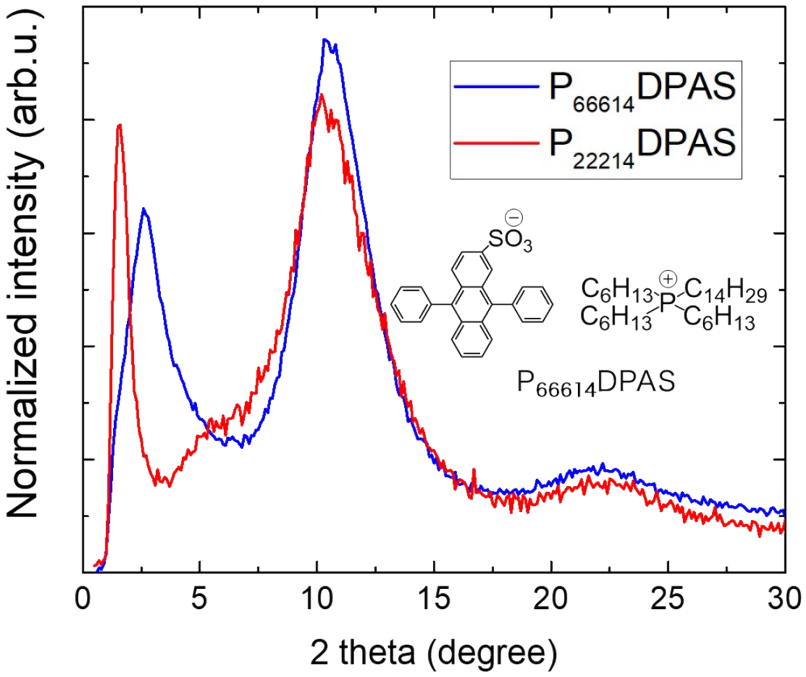

Figure S2. Synchrotron PXRD patterns of P_{66614}DPAS (blue) and P_{22214}DPAS (red) in the IL states. Chemical structure of P_{66614}DPAS is shown.

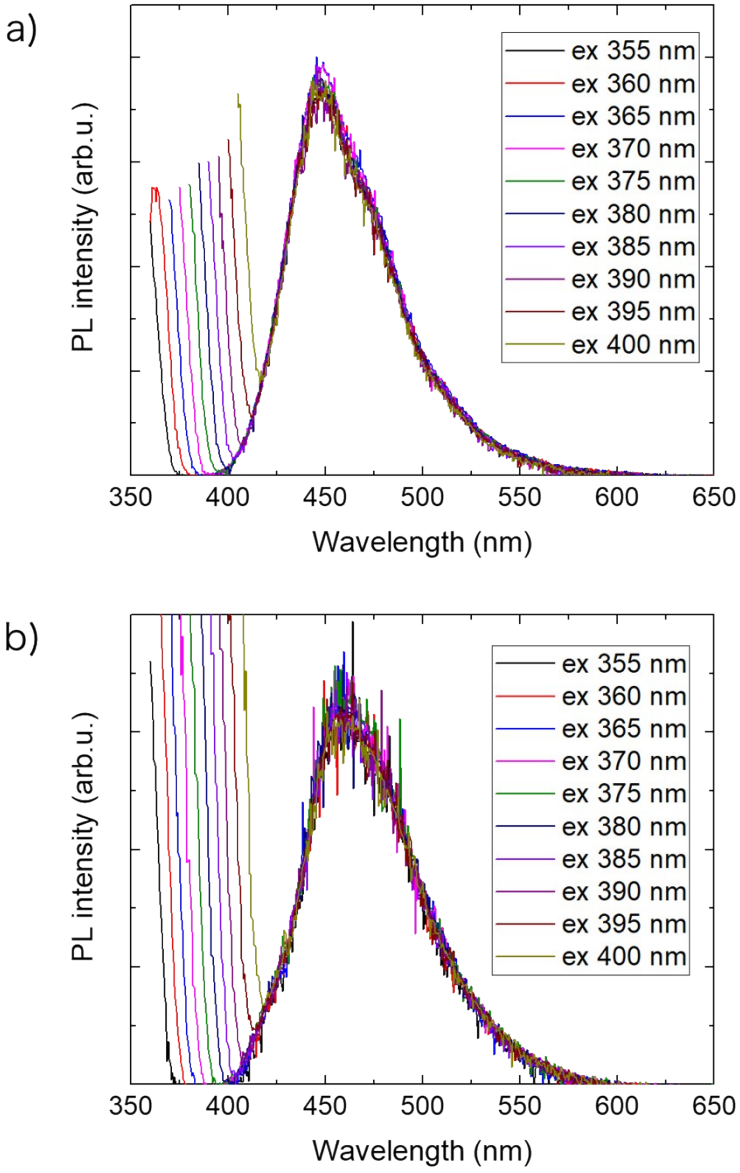

Figure S3. Excitation wavelength dependence of emission spectra in (a) IC state and (b) IL state.

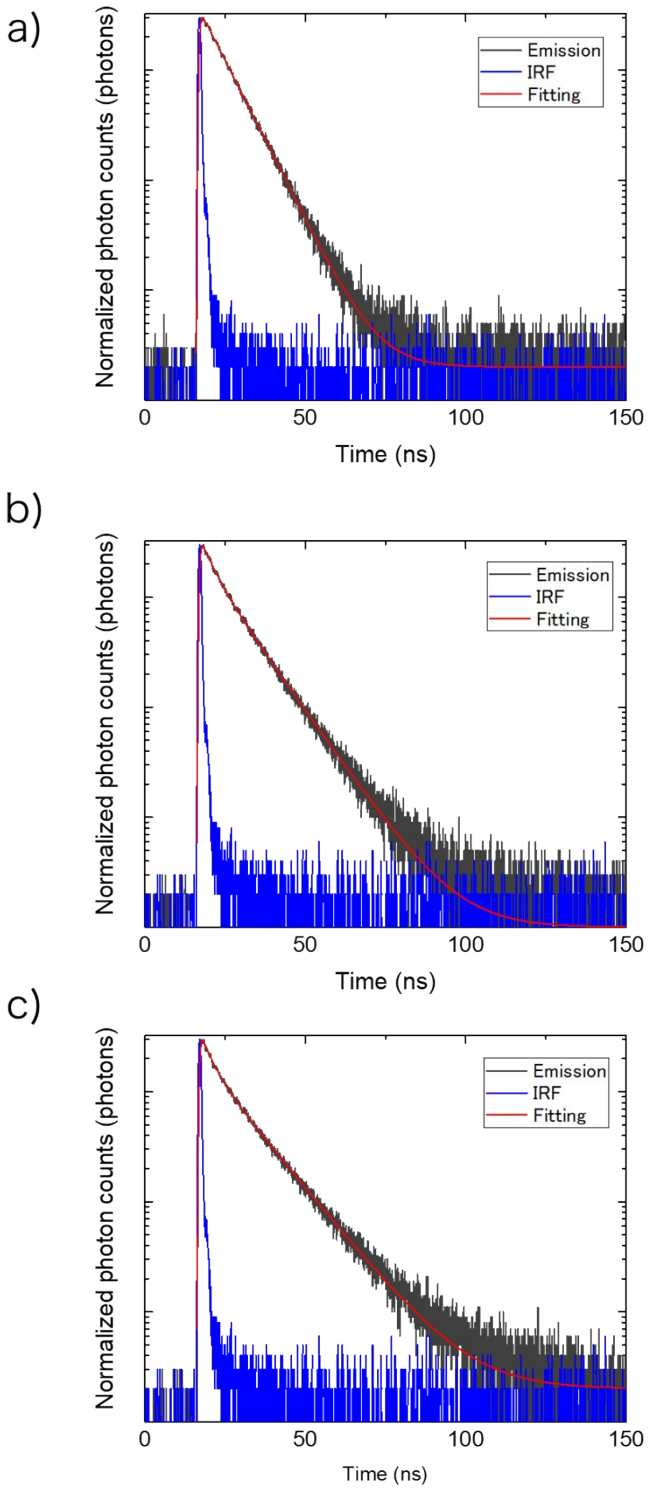

Figure S4. Fluorescence decays of P_{22214}DPAS in (a) 0.01 mM methanol solution, (b) IC and (c) IL states. Excitation wavelength was 365 nm and detection wavelengths were 440 nm for solution and

450 nm for IC and IL states.

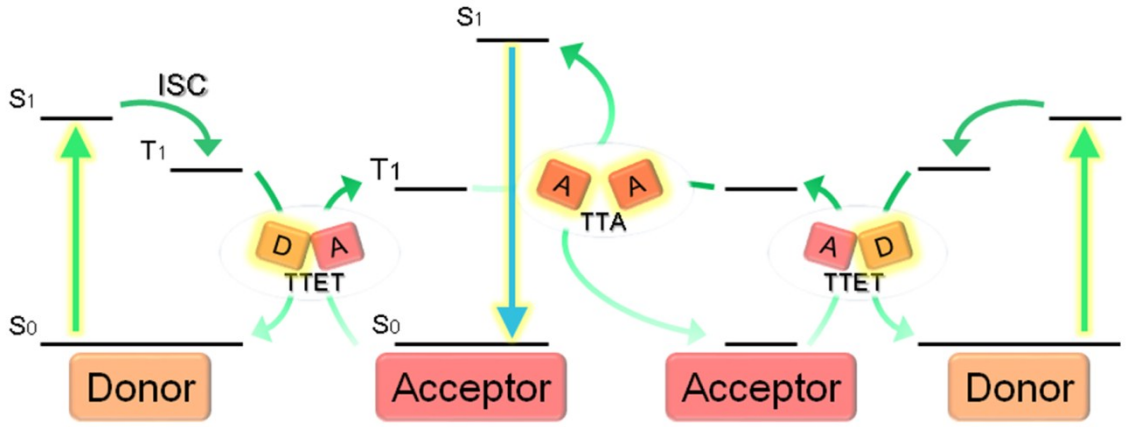

Figure S5. Outline of the TTA-UC process, showing the energy levels involved in the TTA-UC. The TTA-UC involves a triplet sensitizer (donor) with high intersystem crossing (ISC) efficiency and an emitter (acceptor) with high fluorescence quantum yield. First, the sensitizer absorbs the low energy light to produce the excited singlet state (S_1). Second, the triplet state (T_1) of the sensitizer is populated through ISC. Third, triplet-triplet energy transfer (TTET) from donor T_1 to the triplet state of the acceptor takes place *via* the Dexter mechanism. Finally, the collision and annihilation (TTA) between two acceptor triplets produce a high-energy singlet excited state (S_1) of the acceptor which radiates upconverted photons as delayed fluorescence.

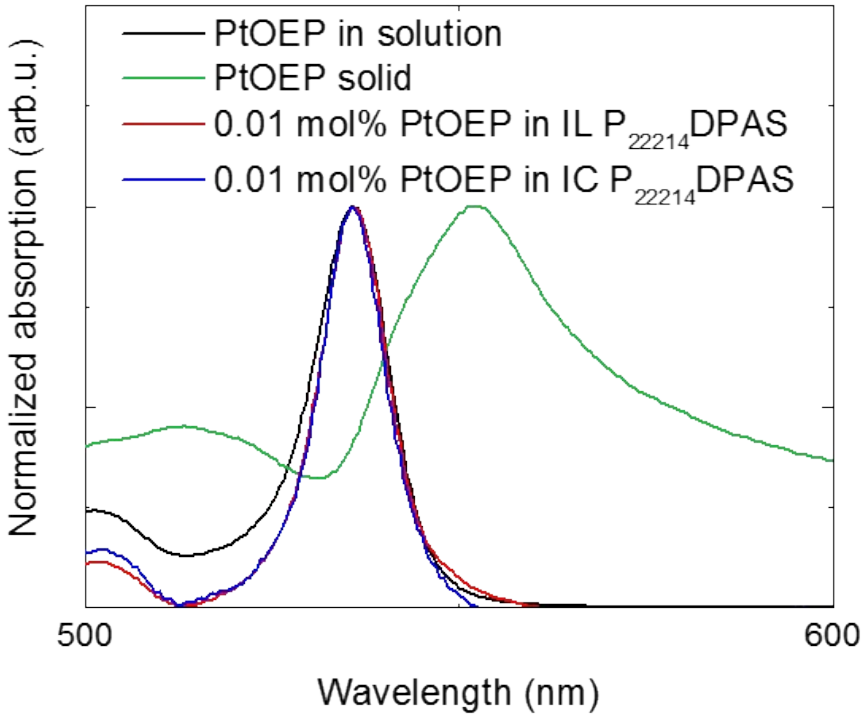

Figure S6. UV-vis absorption spectra of IL P_{22214}DPAS with 0.01mol% PtOEP (red), IC P_{22214}DPAS with 0.1mol% PtOEP (blue), chloroform solution of PtOEP (black line), and bulk solid PtOEP (green).

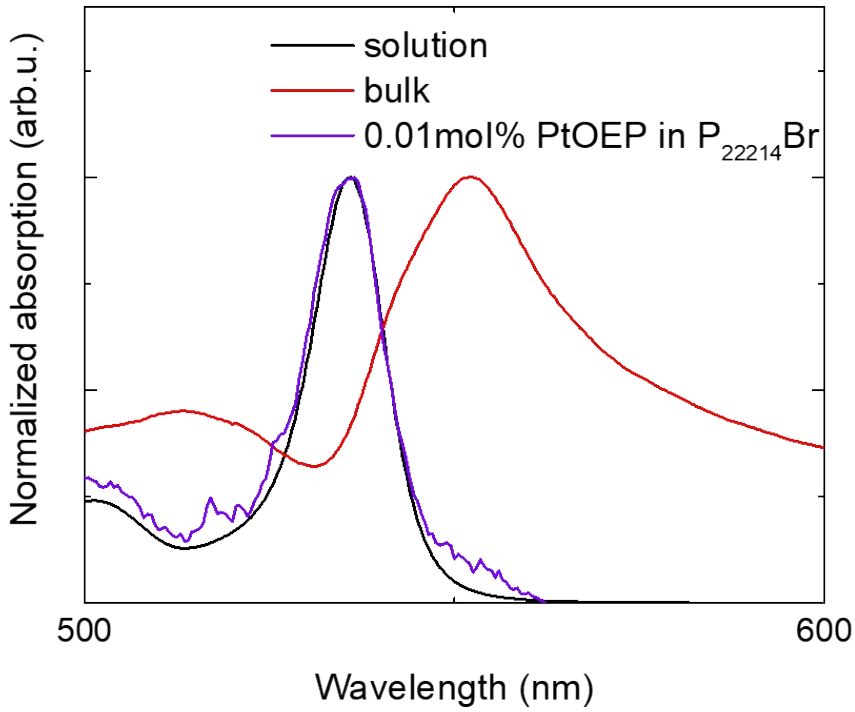

Figure S7. UV-vis absorption spectra of IC $P_{22214}Br$ with 0.01mol% PtOEP (purple), chloroform solution of PtOEP (black line), and bulk solid PtOEP (red).

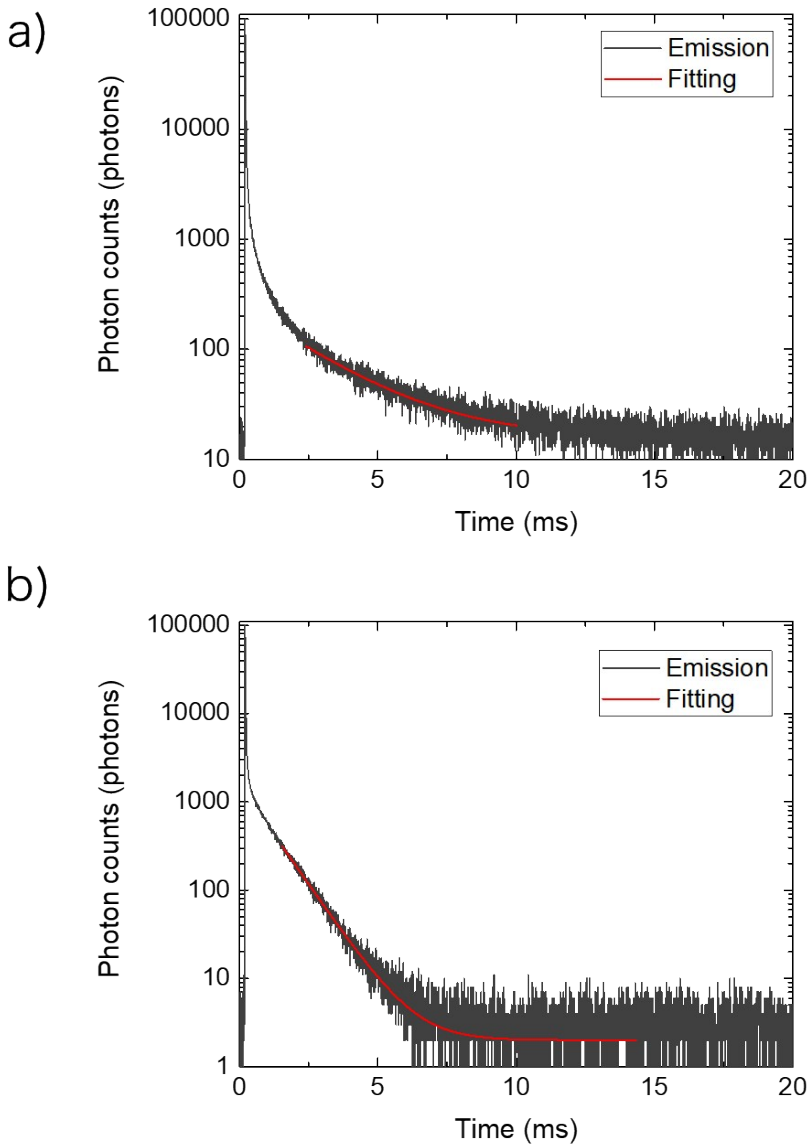

Figure S8. TTA-UC decays of P_{22214}DPAS in (a) IC and (b) IL states. Excitation wavelength was 531 nm and detection wavelengths were 450 nm.

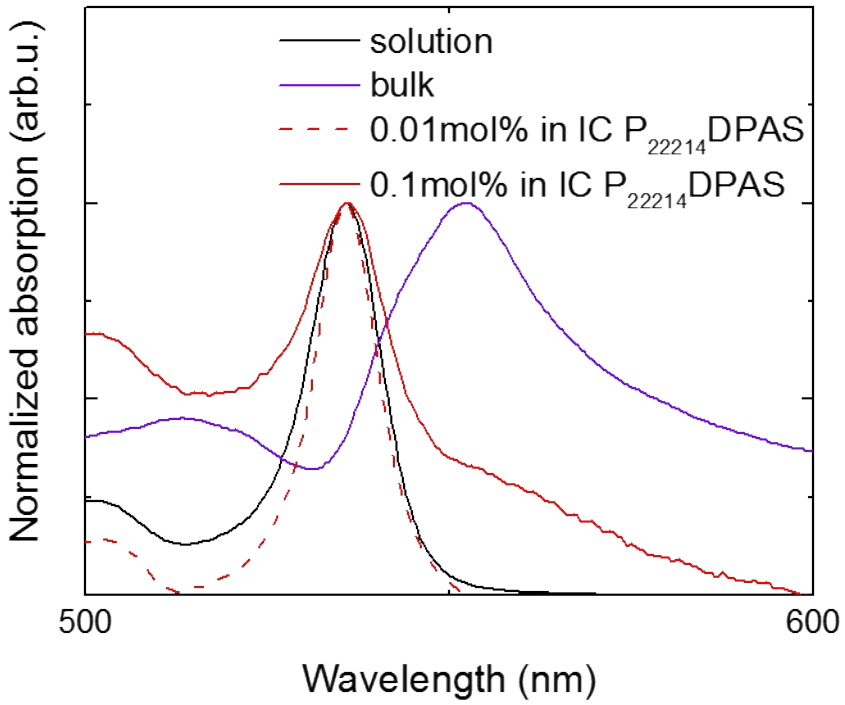

Figure S9. UV-vis absorption spectra of IC P_{22214}DPAS with 0.1mol% PtOEP (red solid line), IC P_{22214}DPAS with 0.01 mol% PtOEP (red dashed line), chloroform solution of PtOEP (black), and bulk solid PtOEP (purple).