Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Achieving Dynamic Quintuple-mode Luminescence in $Ca_3Ti_2O_7$: Pr^{3+}, Er^{3+} Phosphor for Anti-counterfeiting Applications

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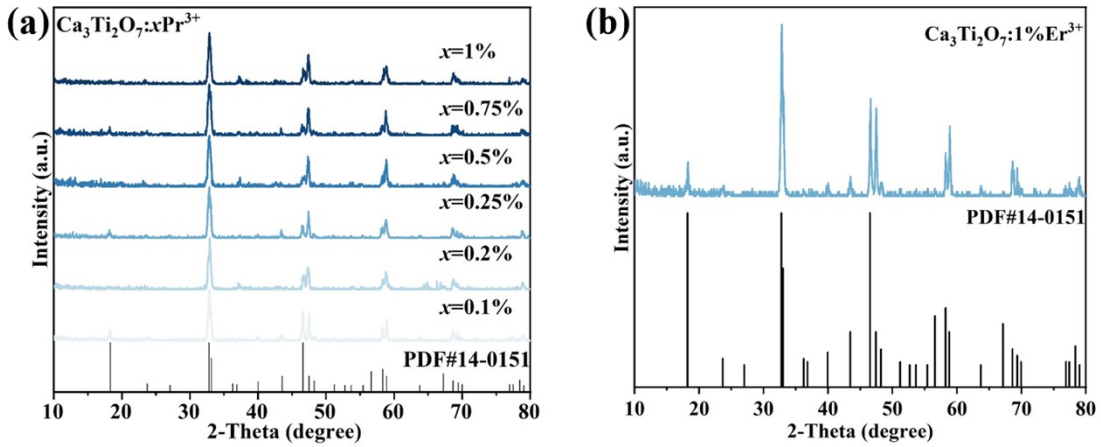

Figure S1. The XRD patterns of (a) $Ca_3Ti_2O_7$: $x$$Pr^{3+}$ (x = 0.1%, 0.2%, 0.25%, 0.5%, 0.75% and 1%) and (b) $Ca_3Ti_2O_7$: 1%Er^{3+} phosphors.

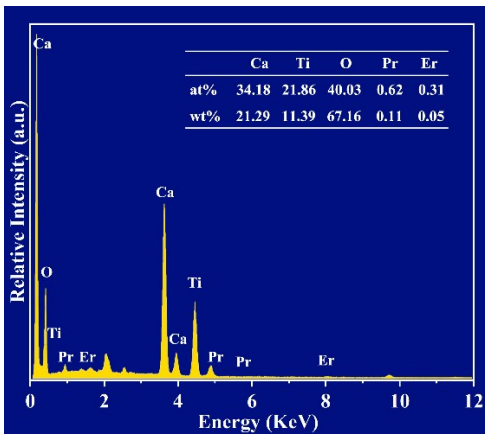

Figure S2. The EDS spectrum of representative $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, 1%Er^{3+}.

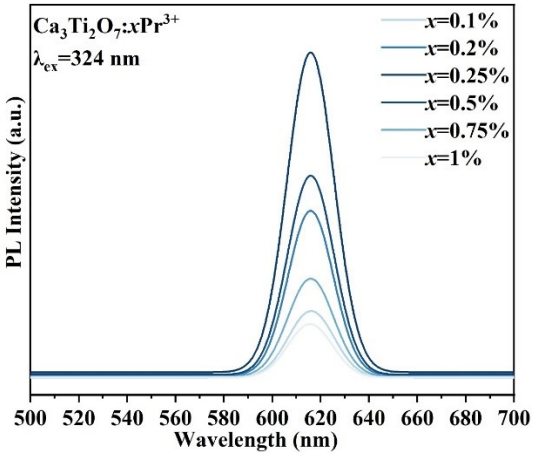

Figure S3. The PL spectra of $Ca_3Ti_2O_7$: $x$$Pr^{3+}$ (x = 0.1%, 0.2%, 0.25%, 0.5%, 0.75% and 1%).

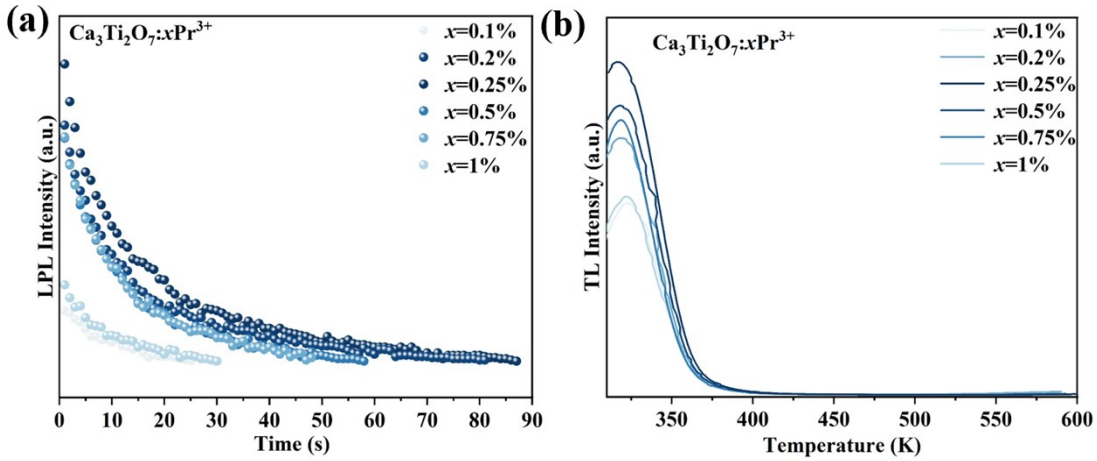

Figure S4. (a) The LPL decay curves and (b) TL curves of $Ca_3Ti_2O_7$: xPr^{3+} (x = 0.1%, 0.2%, 0.25%, 0.5%, 0.75% and 1%).

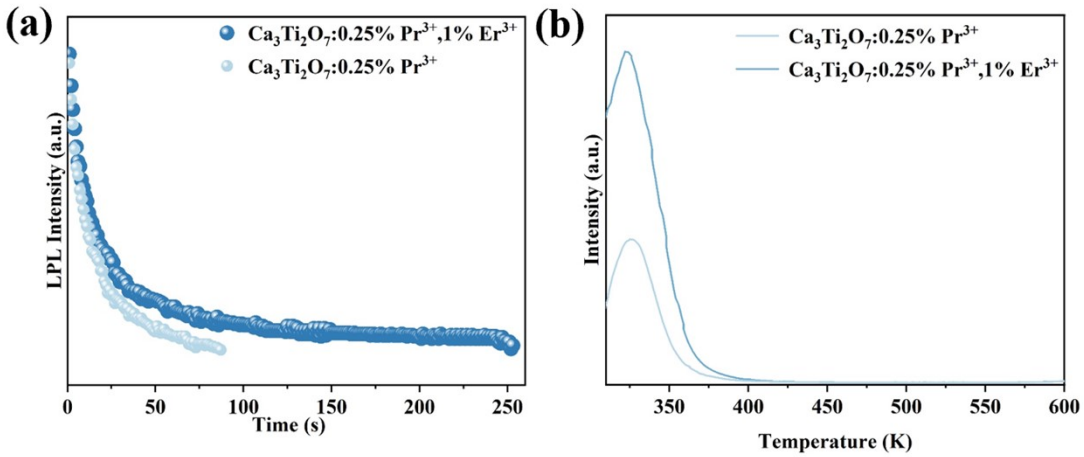

Figure S5. (a) The LPL decay curves and (b) TL curves of $Ca_3Ti_2O_7$: 0.25%Pr^{3+} and $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, 1%Er^{3+}.

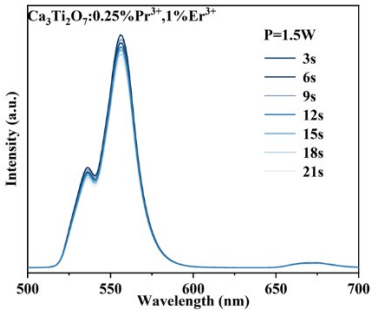

Figure S6. The UCL spectra of $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, 1%Er^{3+} under 980 nm (1.5 W) laser with the irradiation time prolonged to 21 s.

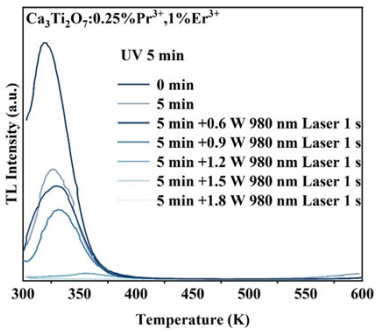

Figure S7. The TL curves of $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, 1%Er^{3+} treated with different pump power of 980 nm laser. The phosphors are charged by UV irradiation for 5 mins.

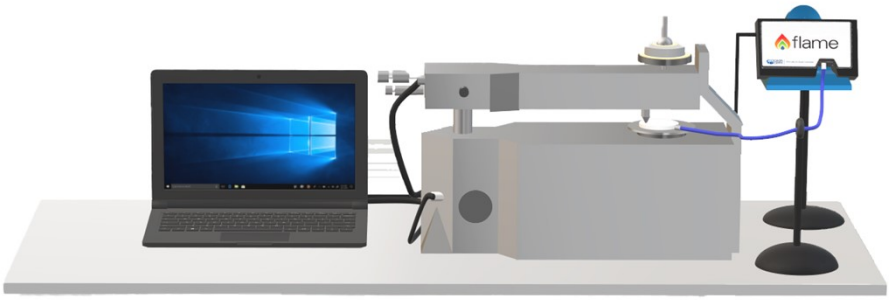

Figure S8. The schematic diagram of MS-T3001 multifunctional material surface property tester cooperated with an optical fiber.

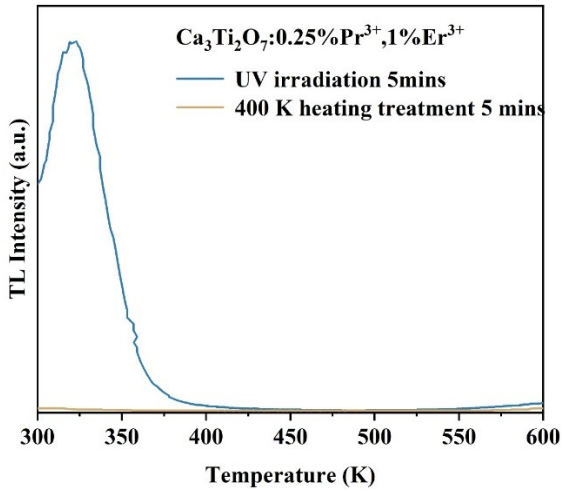

Figure S9. The TL curves of $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, 1%Er^{3+} with UV irradiation for 5 mins or heating treatment at 400 K for 5 mins.

The ML composited films were fabricated by uniformly mixing the sifted powders (600 mesh size) with the PDMS at the weight ratio of 1:3, followed by transferring the mixture into cylindrical mold. Finally, the ML films were successfully shaped in the drying oven at 340 K for 3 h.

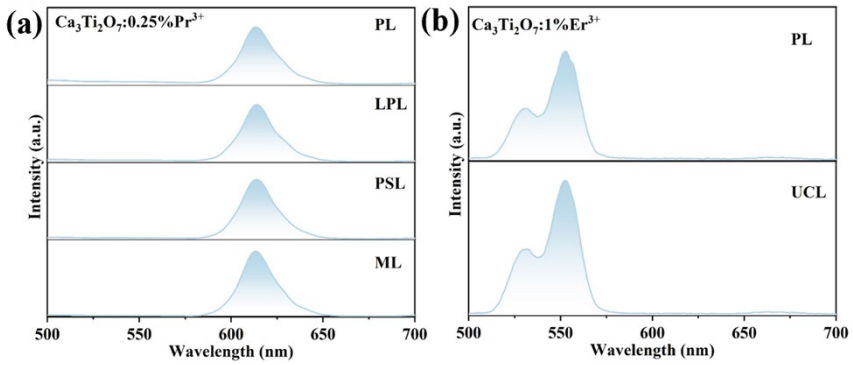

Figure S10. (a) The PL, LPL, PSL, ML spectra of $Ca_3Ti_2O_7$: 0.25%Pr^{3+}, (b) The PL and UCL spectra of $Ca_3Ti_2O_7$: 1%Er^{3+}.