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

Supporting Information

Optimized photoluminescence of red phosphor $K_2TiF_6:Mn^{4+}$ synthesized at room temperature and its formation mechanism

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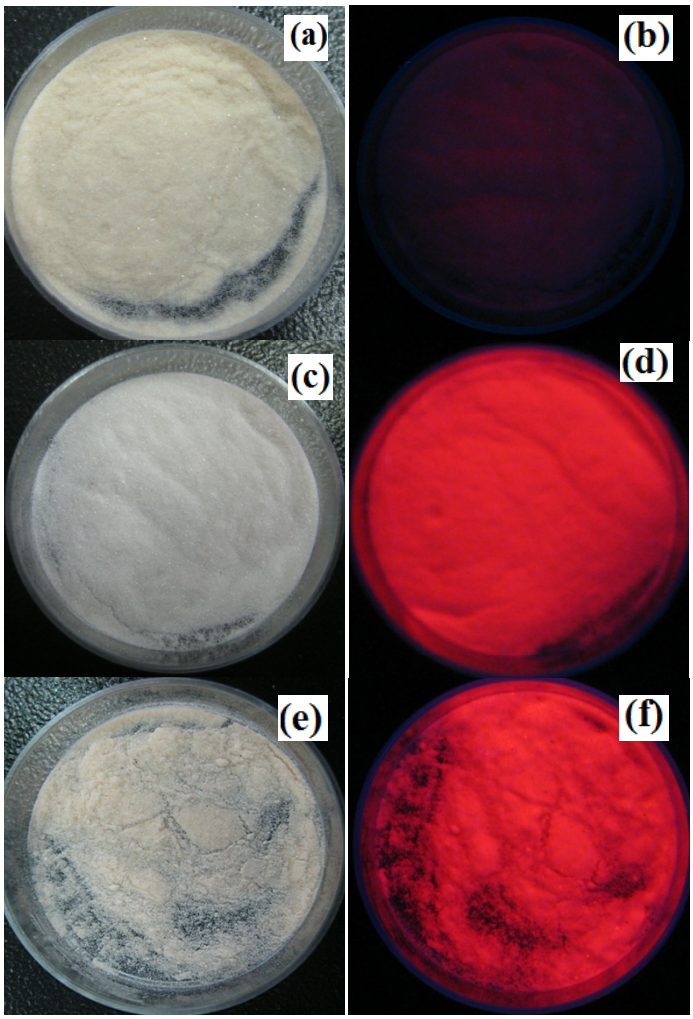

Figure S1. Photographs of the phosphor samples (a,b) KTFM-1, (c,d) KTFM-2, and (e,f) KTFM-3 (prepared according to the detailed experimental process as described in Table 1) under (a,c,e) visible light and (b,d,f) 365 nm UV light excitation, respectively.

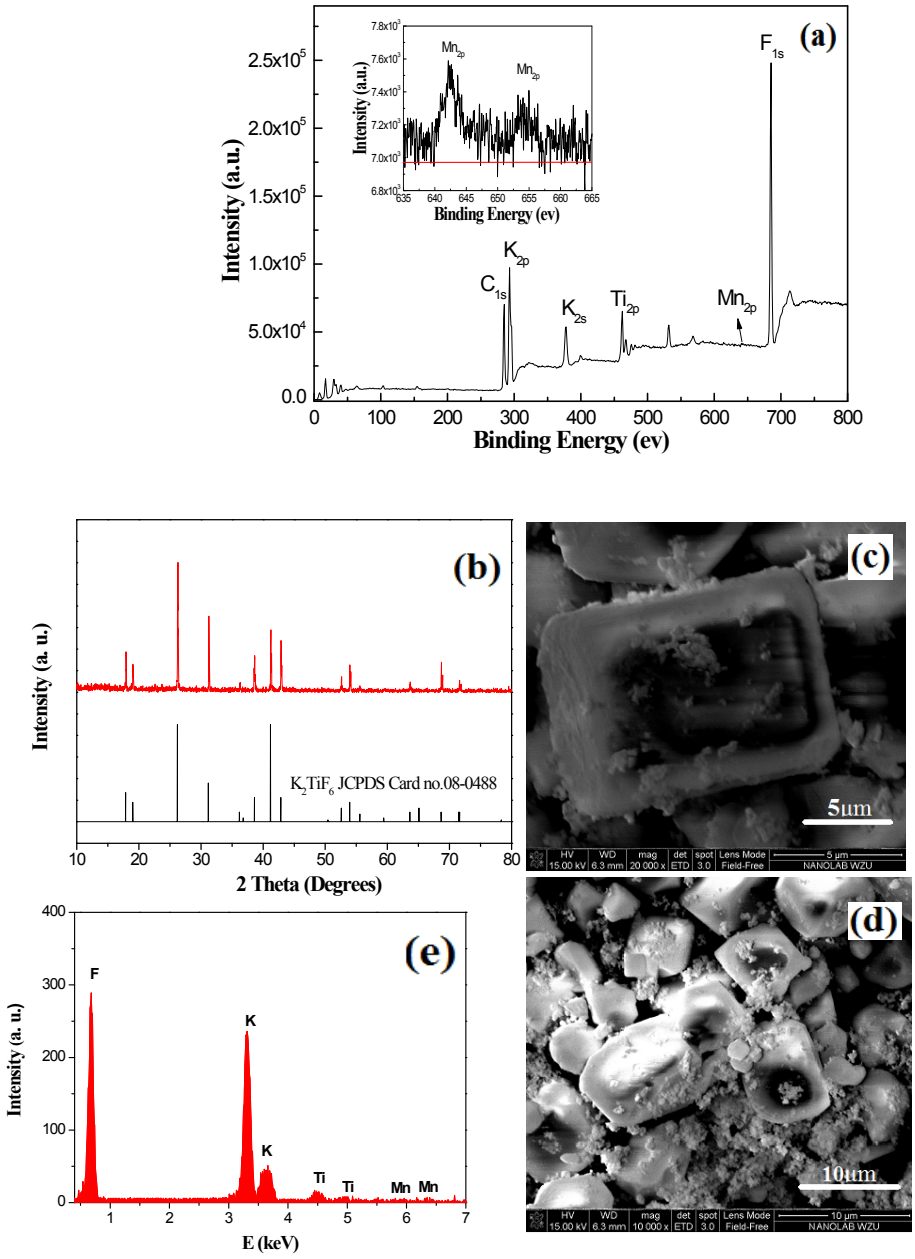

Figure S2. (a) X-ray photoelectron spectroscopy (XPS) of K_2TiF_6:Mn^{4+} prepared by from $Ti(OC_4H_9)_4$. (b) XRD, (c,d) SEM images, and (e) EDS spectrum of red phosphor K_2TiF_6 :Mn^{4+} prepared from TiO_2.

Note: XPS spectrum was obtained with a PHI 5000 (ULVAC-PHI, Chigasaki, Kanagawa, Japan) system equipped with a 450 W monochromatic Al Kα X-ray under ultra-high vacuum.

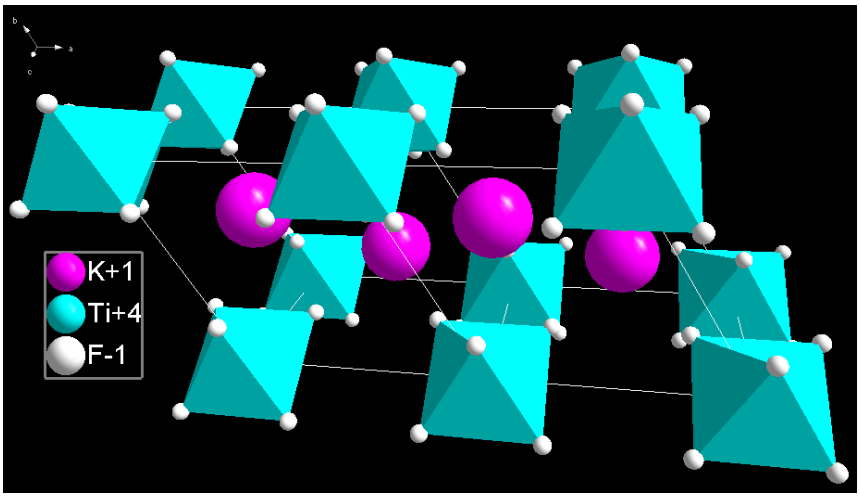

Figure S3. The structure projection of K_2TiF_6 with hexagonal structure plotted by software Diomand 3.0.

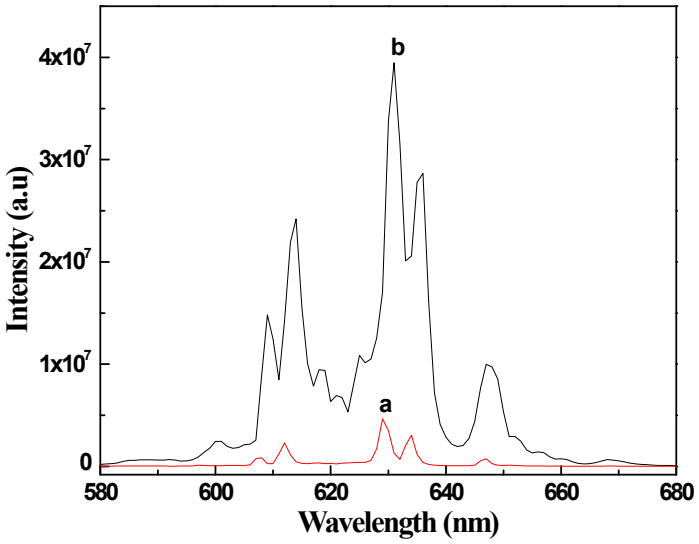

Figure S4. Emission spectra of red phosphors $K_2TiF_6:Mn^{4+}$ prepared by etching (a)TiO_2 and (b) $Ti(OC_4H_9)_4$, respectively. Note: all the other experimental parameters are identical for both synthetic techniques.

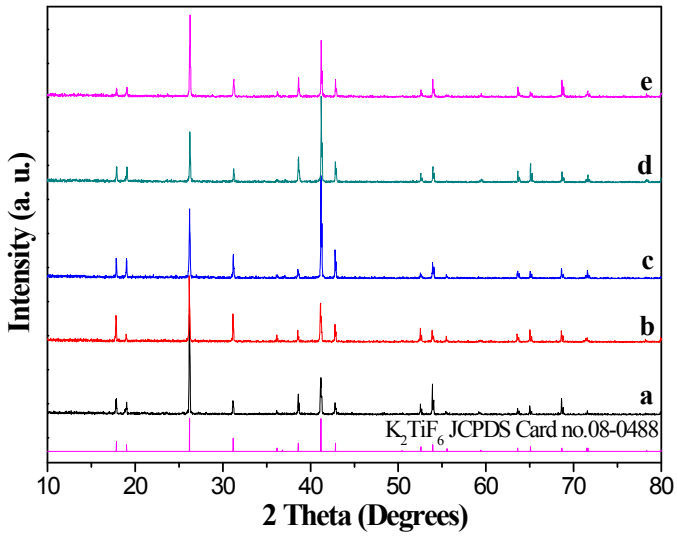

Figure S5. XRD patterns of red phosphors $K_2TiF_6:Mn^{4+}$ prepared by wet chemical etching at room temperature with concentration of $KMnO_4$ at (a) 0, (b) 5, (c) 10, (d) 25, (e) 30, (f) 60 $mmol.L^{-1}$.

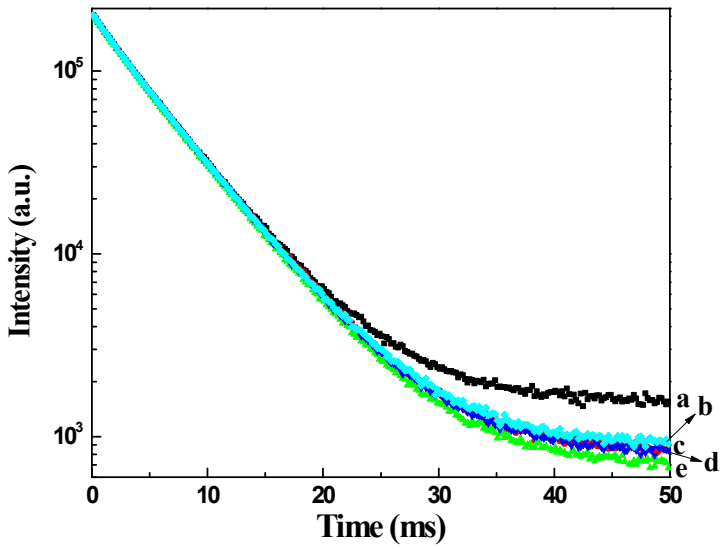

Figure S6. Decay curves of red phosphors $K_2TiF_6:Mn^{4+}$ prepared by wet chemical etching at room temperature with concentration of $KMnO_4$ at (a) 0, (b) 5, (c) 10, (d) 25, (e) 30, (f) 60 $mmol.L^{-1}$.

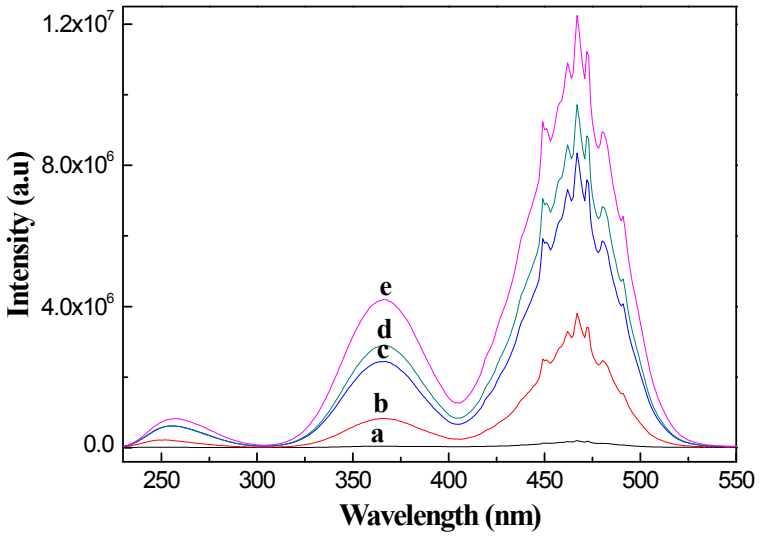

Figure S7. Excitation spectra (monitored at 631 nm) of red phosphors $K_2TiF_6:Mn^{4+}$ prepared by wet chemical etching at room temperature with concentration of HF at (a) 5, (b) 10, (c) 20, (d) 30, (e) 40 wt.%.

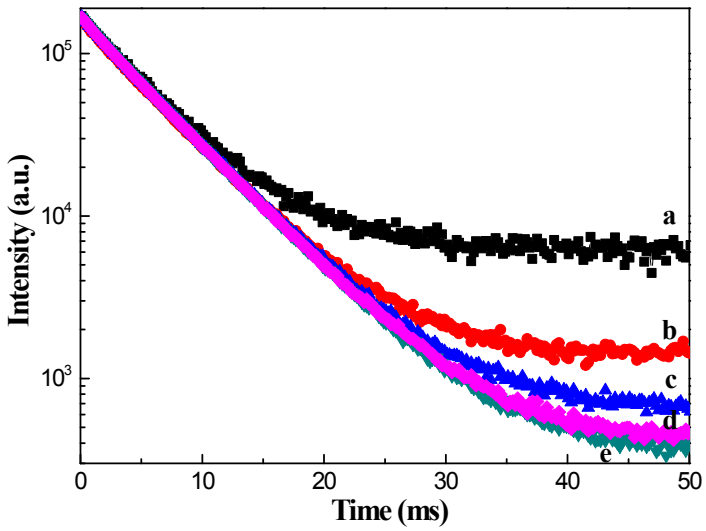

Figure S8. Dependence of decay of 631 nm emissions of red phosphor $K_2TiF_6:Mn^{4+}$ (excited at 467 nm) prepared with concentration of HF at (a) 5, (b) 10, (c) 20, (d) 30, (e) 40 wt.%.

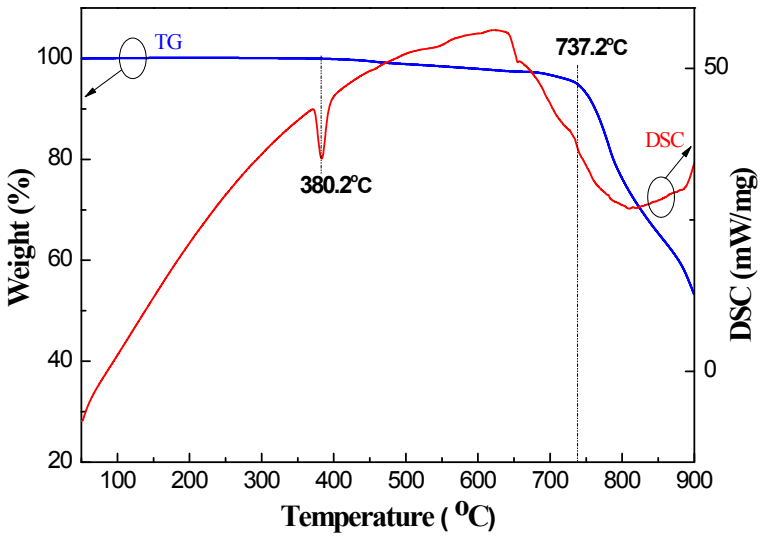

Figure S9. Thermogravimetrics (TG) and different scanning calorimeter (DSC) graphs of as synthesized $K_2TiF_6:Mn^{4+}$ under N_2 atmosphere. The thermal stability the red phosphor behavior of $K_2TiF_6:Mn^{4+}$ is investigated by thermogravimetrics analysis and different scanning calorimeter (DSC; Netzsch STA 449 C, at a heating rate of 10K/min). (The data are repeatable).

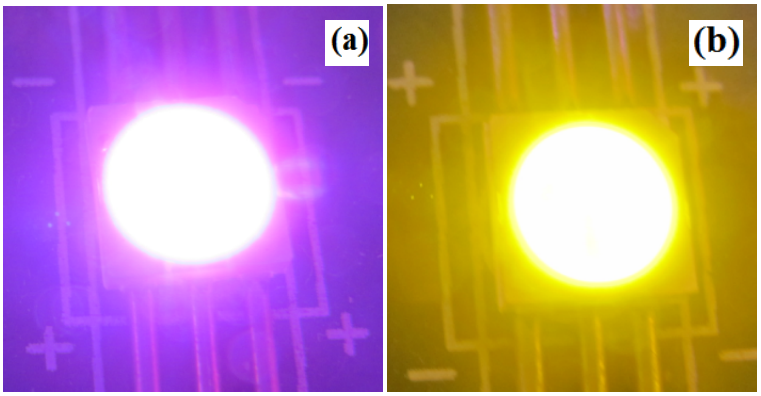

Figure S10. Photographs of (a) purple LED fabricated with $K_2TiF_6:Mn^{4+}$, and (b) "warm" white LED fabricated with $K_2TiF_6:Mn^{4+}$ and $YAG:Ce^{3+}$ driven at under 60-mA current. The LEDs were examined by a LEE300E UV-Vis-near IR spectrophotocolorimeter (Everfine photo-E-Infor Co., China).