Supporting Information

**Manuscript ID:** NR-ART-03-2019-002532

**TITLE:** Exceptional Modulation of Upconversion and Downconversion Near-infrared Luminescence in Tm/Yb Codoped Ferroelectric Nanocomposite by Nanoscale Engineering

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![Fig. S1](image1.png)

**Fig. S1.** (a) The whole upconversion spectra of the P-0 and P-200 samples. (b) The upconversion spectra from 750 to 840 nm of the P-0 and P-200 samples.

![Fig. S2](image2.png)

**Fig. S2.** (a) Double logarithmic plot of upconversion intensity of Yb$^{3+}$/Tm$^{3+}$ codoped sample dependent on the excitation power density after loading an electric field of 200 kV/cm. (b) Double logarithmic plot of downconversion intensity of Yb$^{3+}$/Tm$^{3+}$ codoped sample dependent on the excitation power density after loading an electric field of 200 kV/cm.
**Fig. S3.** (a) The measured downconversion infrared decay curves of Tm$^{3+}$:F$_4^-$H$_6$. (b) The trend of P-j lifetime relative to the elevated electric field.

**Fig. S4.** (a) The schematic diagram of the lanthanide ions enters the LiNbO$_3$ crystal structure. (b) A partial enlargement shows the ligand field around Yb$^{3+}$/Tm$^{3+}$. 