

Highly efficient upconversion emission of Er³⁺ in δ -Sc₄Zr₃O₁₂ and broad-range temperature sensing

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Figure S1-S

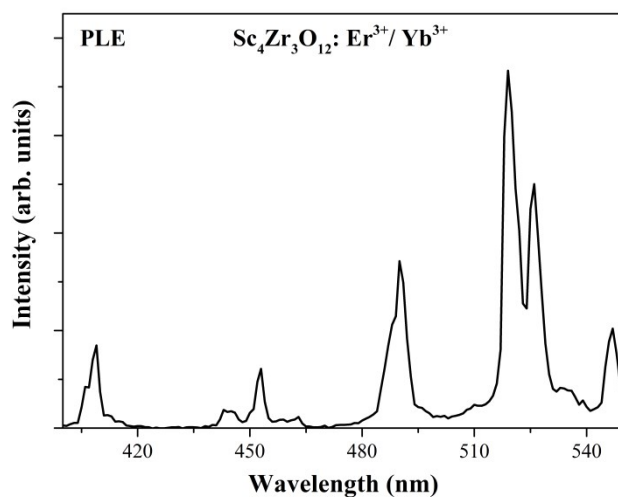


Figure S1. The excitation spectrum of Sc₄Zr₃O₁₂:1%Er³⁺/2%Yb³⁺ sample monitored at 563 nm.

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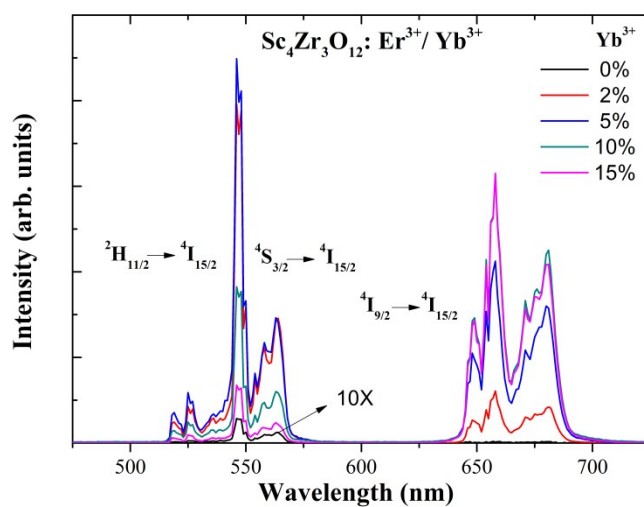


Figure S2. UC luminescence spectra of $\text{Sc}_4\text{Zr}_3\text{O}_{12}:\text{Er}^{3+}/\text{Yb}^{3+}$ series samples with different Yb^{3+} doping concentrations by 972 nm excitation.

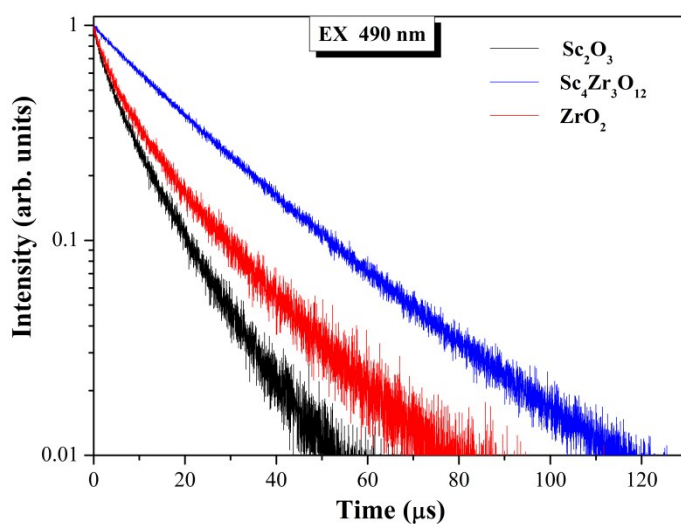


Figure S3. Decay curves of $\text{Er}^{3+}/\text{Yb}^{3+}$ codoped Sc_2O_3 , $\text{Sc}_4\text{Zr}_3\text{O}_{12}$ and ZrO_2 samples monitored at 546 nm under 490 nm excitation.

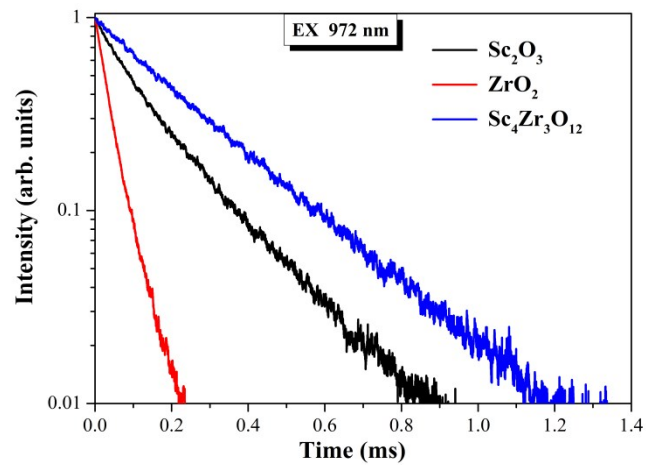


Figure S4. Under 972 nm excitation, the decay curves of Er³⁺/Yb³⁺ codoped Sc₂O₃, Sc₄Zr₃O₁₂ and ZrO₂ samples when monitoring at 546 nm.