# Supporting Information

## Up-converting $LuVO_4$: $Nd^{3+}/Yb^{3+}/Er^{3+}@SiO_2@Cu_2S$ Hollow Nanoplatforms for Self-monitored Photothermal Ablation

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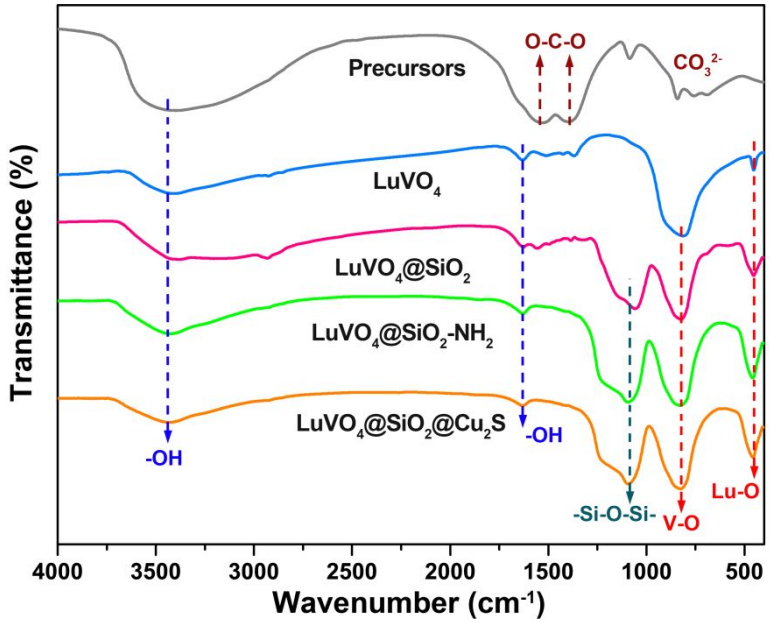


**Figure S1.** FT-IR spectra of precursors, $LuVO_4$, $LuVO_4@SiO_2$, $-NH_2$ modified $LuVO_4@SiO_2$ and $LuVO_4@SiO_2@Cu_2S$ nanoparticles.

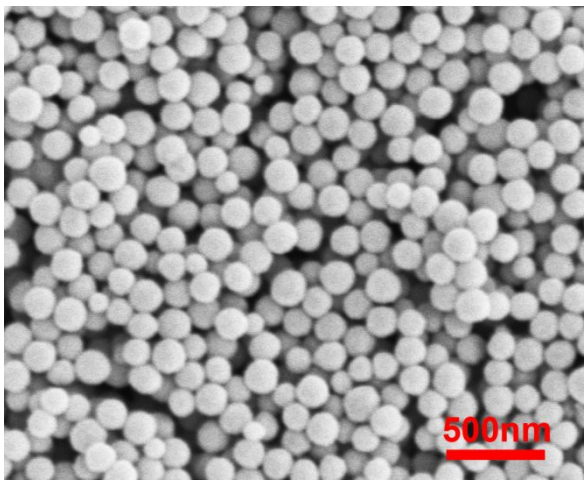


**Figure S2.** SEM image of spherical precursors.

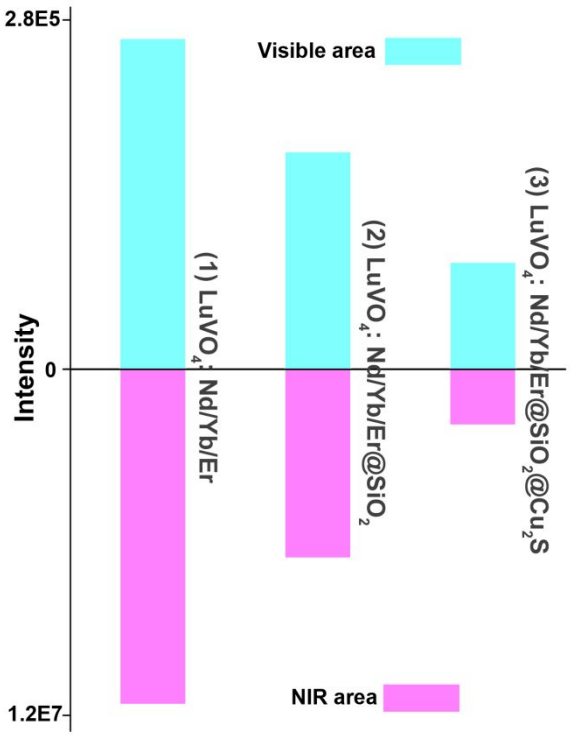


**Figure S3.** The integrated emission intensity in visible and NIR regions of $Nd^{3+}/Yb^{3+}/Er^{3+}$ tri-doped (1) $LuVO_4$, (2) $LuVO_4@SiO_2$ and (3) $LuVO_4@SiO_2@Cu_2S$ nanoparticles under 808 nm excitation.

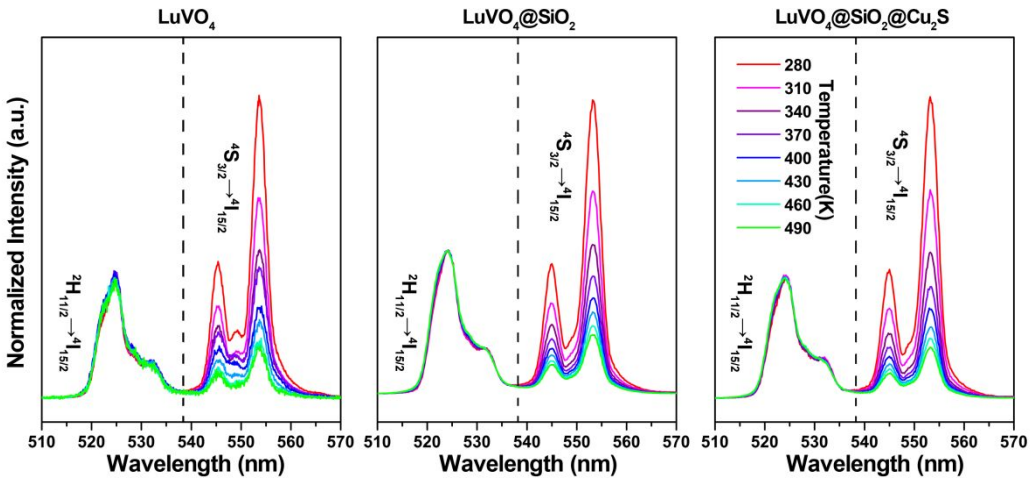


**Figure S4.** Temperature-dependent UC emission spectra of $Nd^{3+}/Yb^{3+}/Er^{3+}$ tri-doped $LuVO_4$, $LuVO_4@SiO_2$ and $LuVO_4@SiO_2@Cu_2S$ nanoparticles in range of 510-570 nm under the excitation of 808 nm laser (normalized at $^2H_{11/2} \rightarrow {}^4I_{15/2}$).

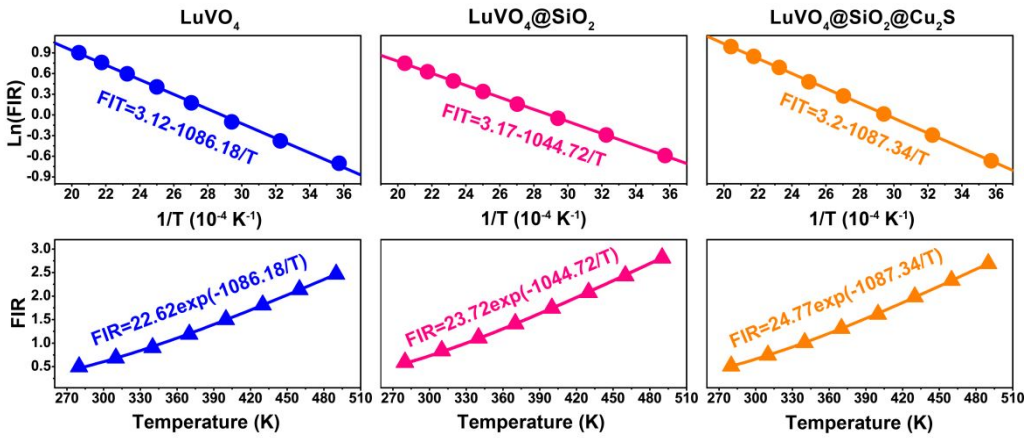


**Figure S5.** The plots of FIR values as a function of temperature in $Nd^{3+}/Yb^{3+}/Er^{3+}$ tri-doped $LuVO_4$, $LuVO_4@SiO_2$ and $LuVO_4@SiO_2@Cu_2S$ nanoparticles.

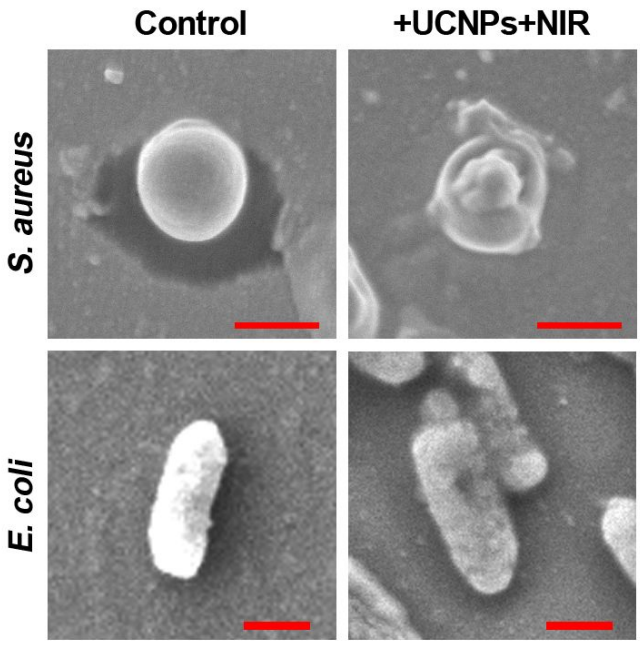


**Figure S6.** SEM images of control group and bacteria (*E. coli* and *S. aureus*) incubated with $LuVO_4$: $Nd^{3+}/Yb^{3+}/Er^{3+}@SiO_2@Cu_2S$ nanoparticles dispersed in PBS solution under 808 nm excitation (scale bar, 500 nm). Both rod-like *E. coli* and spherical *S. aureus* bacterium remained intact and smooth surface in control group, while broken and wrinkled cell membranes with several holes were observed in +UCNPs+NIR group.