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Synthesis and photocatalytic activity of δ -doped hexagonal NaYF₄:Yb,Tm@TiO₂/RGO nanocrystals

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Figure S1. Scanning electron microscopy (SEM) images of $NaYF_4@\beta-NaYF_4:Yb,Tm@NaYF_4@TiO_2/RGO.$



Figure S2. (a) Upconversion luminescence spectra and (b) luminescence decay curves of the emission peak at about 477 nm for the NaYF₄:Yb³⁺,Tm³⁺ nanoparticles synthesized at 280°C with different amount of OA. (c) Upconversion luminescence spectra and (b) luminescence decay curves of the emission peak at about 477 nm for the NaYF₄:Yb³⁺,Tm³⁺ nanoparticles synthesized at different reaction temperature with 7.5 mL OA.



Figure S3. The UV-Vis absorption spectra of P25 under UV irradiation.

1. Yi, G. S., Chow, G. M., "Synthesis of Hexagonal-Phase NaYF4:Yb,Er and NaYF4:Yb,Tm

Nanocrystals with Efficient Up-Conversion Fluorescence. Adv. Funct. Mater. 16, 2324-2329(2006).

Liang, J., Gao, H., Yi, M., Shi, W., Liu, Y.; Zhang, Z., Mao, Y., "β-NaYF4:Yb³⁺, Tm³⁺@TiO₂
core-shell nanoparticles incorporated into the mesoporous layer for high efficiency perovskite solar
cells". Electrochim. Acta 261, 14-22(2018).