

Supplementary information:

3-Dimensional Photonic Crystal Surface Enhanced Upconversion Emission for Improved Near-infrared Photoresponse

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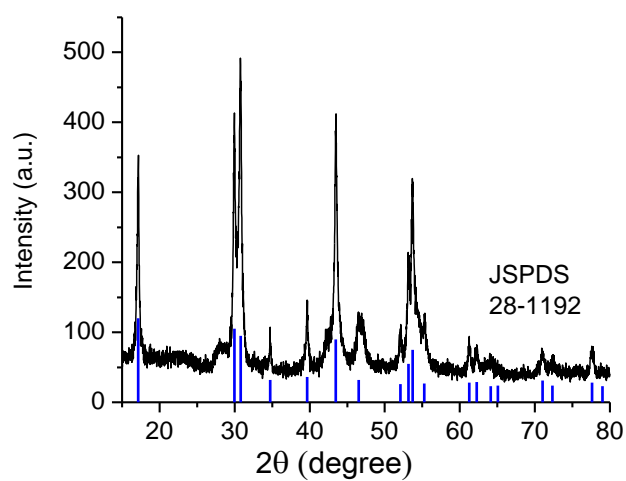


Fig. S1 XRD patterns of NaYF₄:Yb/Er UCNPs

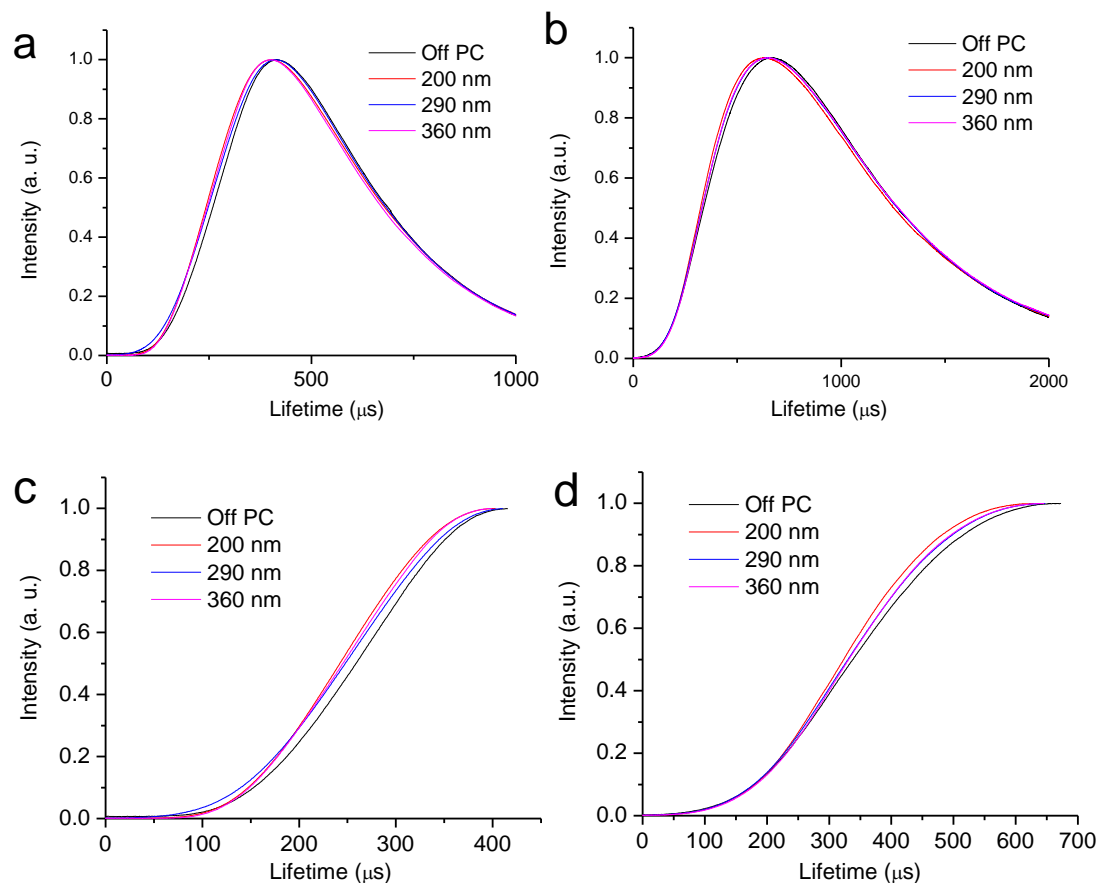


Fig.S2 Upconversion luminescence rise and decay curves monitoring the 540 nm (a) and 477 nm (b) emissions of NaYF₄:Yb/Er and NaYF₄:Yb/Tm UCNPs off and on 3D PCs with different polystyrene sphere sizes, respectively, and the corresponding enlarged rise curves of NaYF₄:Yb/Er (c) and NaYF₄:Yb/Tm UCNPs (d).

Table S1. Upconversion luminescence rise time monitoring the 540 nm (a) and 477 nm (b) emissions of NaYF₄:Yb/Er and NaYF₄:Yb/Tm UCNPs off and on 3D PCs with different polystyrene sphere sizes, respectively.

3D PCs with different polystyrene sphere sizes	Without 3D PC	200 nm	290 nm	360 nm
Rise times of 540 nm of NaYF ₄ :Yb/Er (μs)	258	242	247	244
Rise times of 477 nm of NaYF ₄ :Yb/Tm (μs)	339	323	327	328

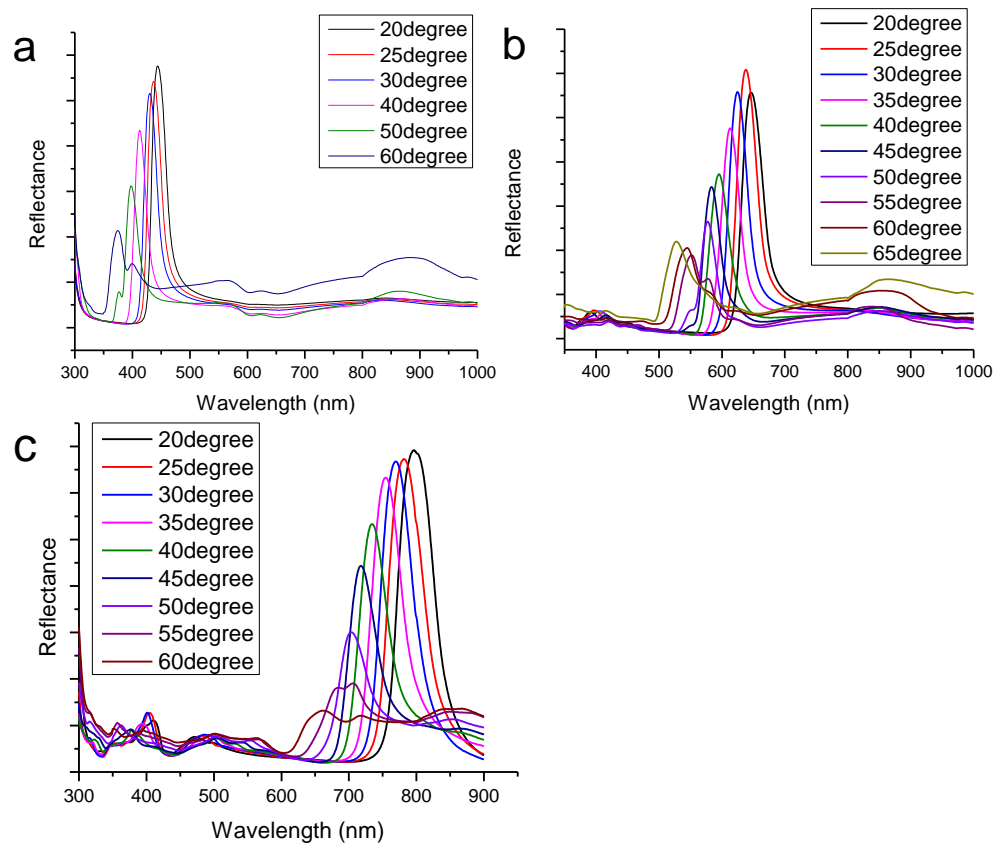


Fig. S3 Angle-dependent reflectance spectra of opal 3D photonic crystals prepared with 200 (a), 290 (b) and 360 nm (c) polystyrene spheres.

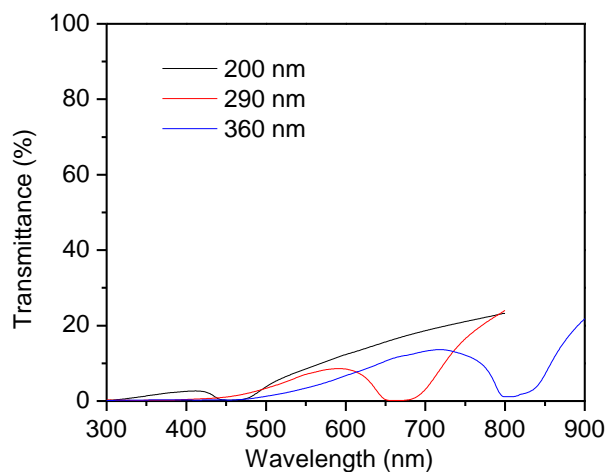


Fig. S4 Transmittance spectra of 3D PCs prepared with different polystyrene sphere sizes at 0.4 wt% concentration.

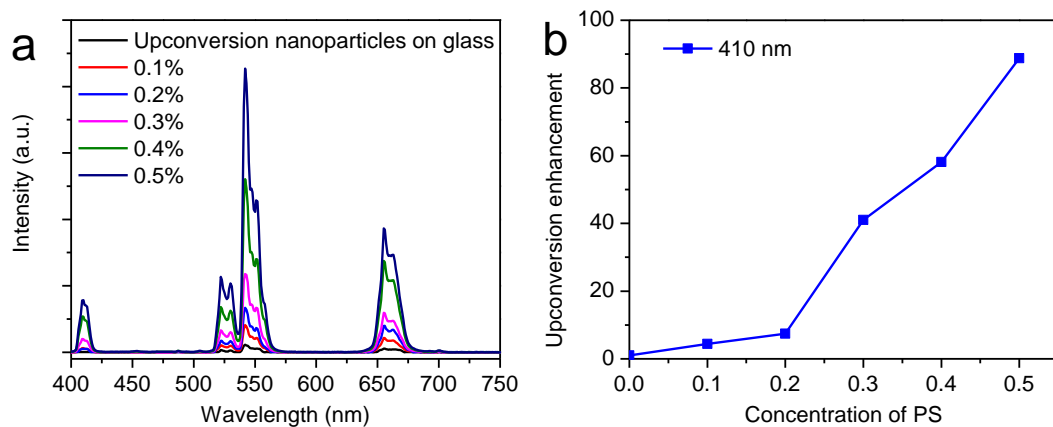


Fig. S5 Upconversion spectra (a) and enhancement factors (b) of NaYF₄:Yb/Er UCNPs on the surfaces of 3D PCs prepared with different concentration of 290 nm polystyrene spheres.

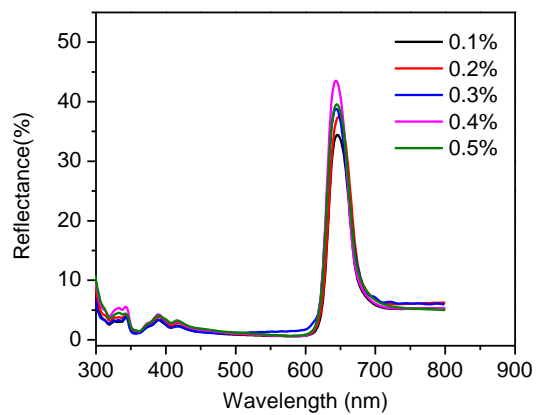


Fig. S6 Reflectance spectra of opal 3D photonic crystals prepared with various concentrations of 290 nm polystyrene spheres. The reflectance spectra were measured at 20° incidence to the normal.