Electronic Supplementary Material (ESI) for RSC Advances.

Mesoporous TiO_2 encapsulating a visible-light responsive upconversion agent for an enhanced sonocatalytic degradation of bisphenol-A

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Visible-light photocatalytic experiment

The photoreactor consisted of a double-layered cylindrical container with a capacity of 250 mL (Φ 10.0 × 10.0 cm). The solution temperature of 15 °C was measured using a thermometer (Tecpel DTM-318) and maintained with a water jacket. A retort stand was used to fix the metal halide lamp and the distance between the top of the reactor and bottom of lamp was about 3.0 cm. Between the reactor and lamp, a UV filter (> 420 nm) was used to remove the UV light. Aqueous suspensions (100 mL) of BPA (5 mg L^{-1}) and catalyst (1 g L^{-1}) were used for the sonocatalytic degradation. At given time intervals, 0.5 mL of the suspension was removed using a 2-mL syringe and filtered by a membrane with a pore size of ~ 0.45 μm. The BPA concentration in the resultant filtrate was analyzed using the same method with that in the sonocatalytic test.

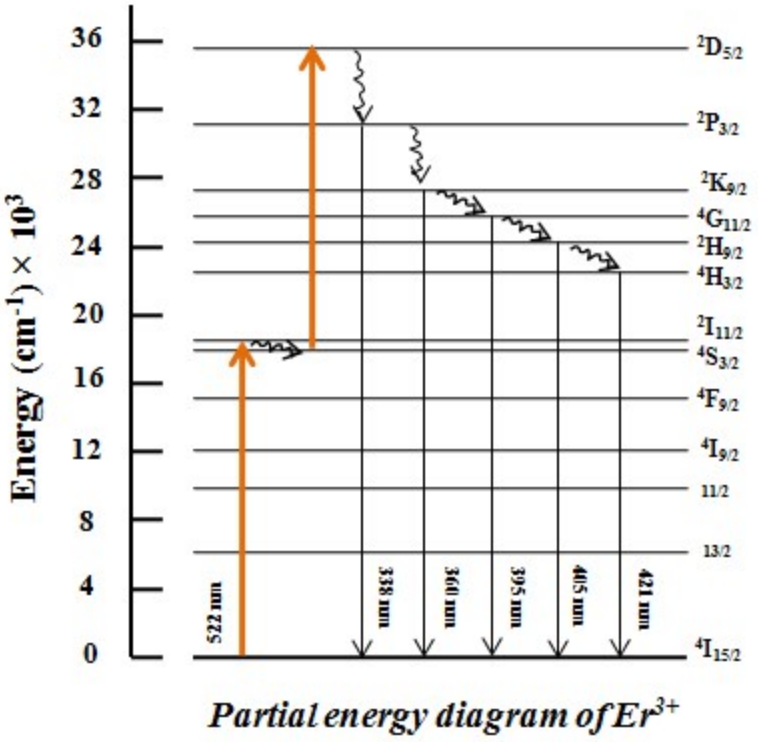

Fig. S1. Schematic illustration for the energy transfer of Er^{3+} in the Y_2O_3 nanocrystals.

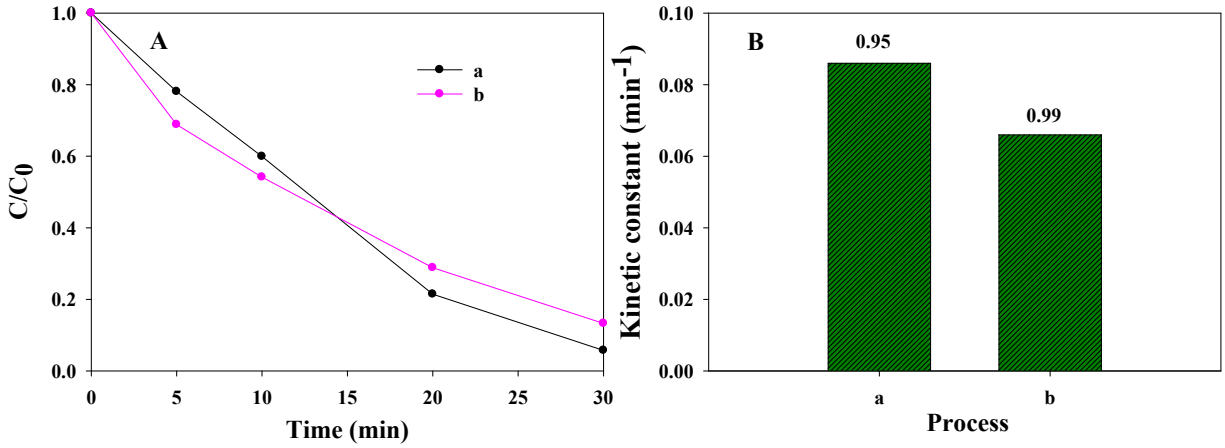

Fig. S2. The sonocatalytic degradation performance (A) and pseudo first-order kinetic constant (B) of BPA with varied sonocatalysts. (a) Er:Y_2O_3-2 and (b) Er:Y_2O_3-2@SiO_2. In (B), the value above the vertical bar is the coefficient of determination (R^2).

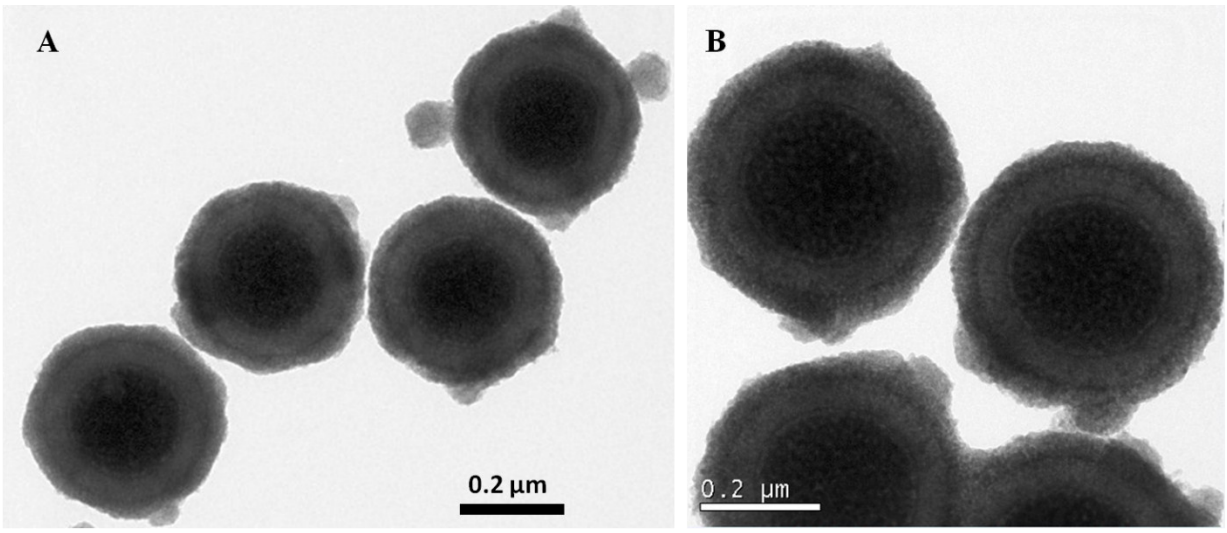

Fig. S3. TEM images of Er:Y_2O_3-1@SiO_2@mTiO_2 (A) and Er:Y_2O_3-3@SiO_2@mTiO_2 (B) prepared *via* a two-step sol-gel coating method.

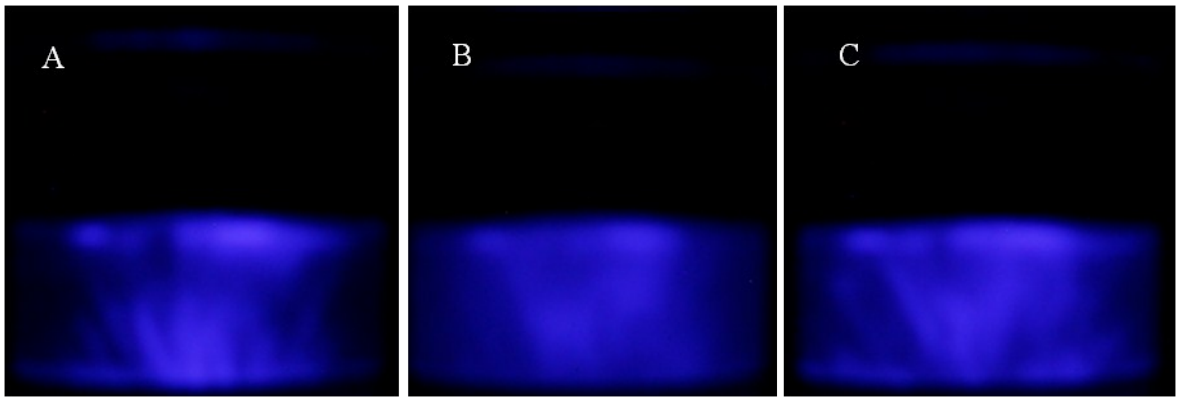

Fig. S4. the photograph of SCL for US alone (A), US + nonporous Er:Y_2O_3-2@SiO_2@TiO_2 (B) and US + Er:Y_2O_3-2@SiO_2@mTiO_2 (C).

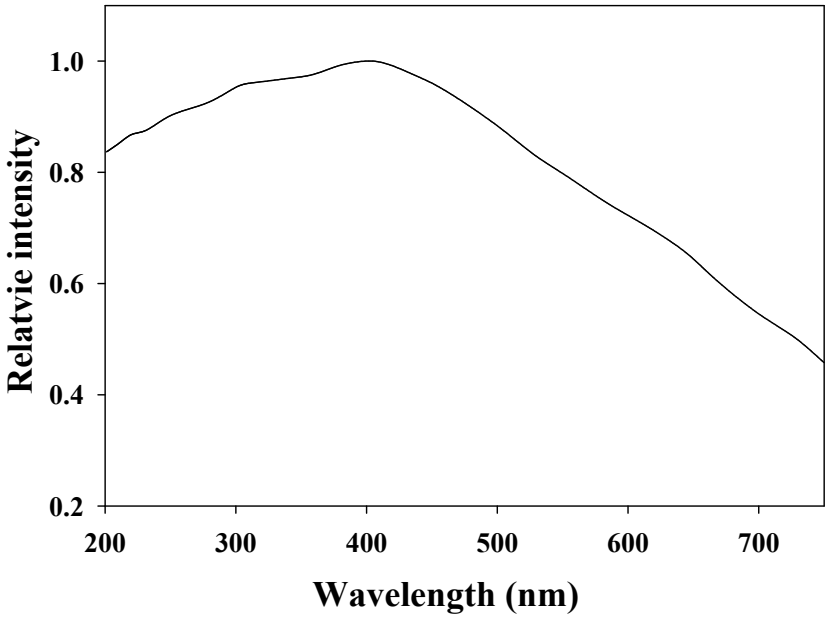

Fig. S5. Spectral variation of sonoluminescence from xenon bubbles. Reprinted from Ref. [1]

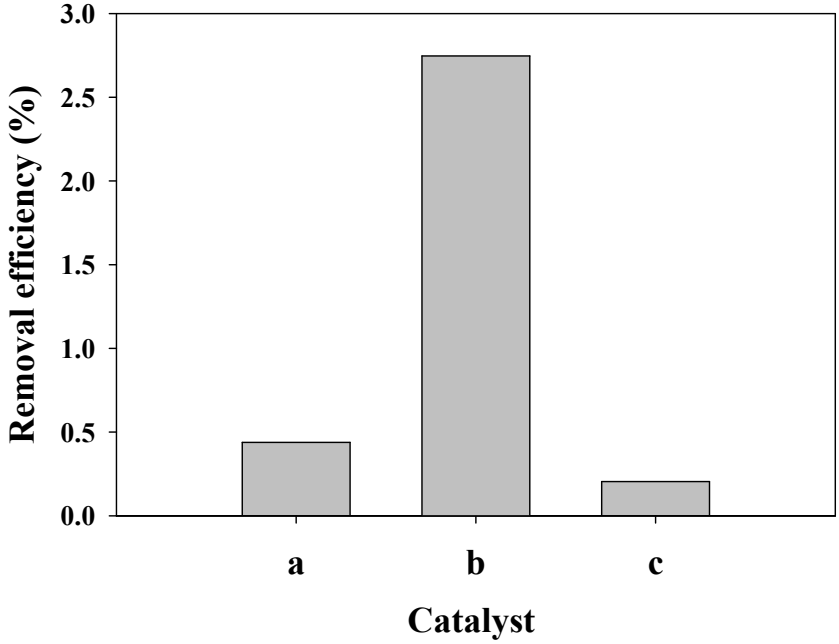

Fig. S6 Adsorption removal efficiency of BPA for catalyst (a) Er:Y_2O_3-1@SiO_2@mTiO_2, (b) Er:Y_2O_3-2@SiO_2@mTiO_2, and (c) Er:Y_2O_3-3@SiO_2@mTiO_2.

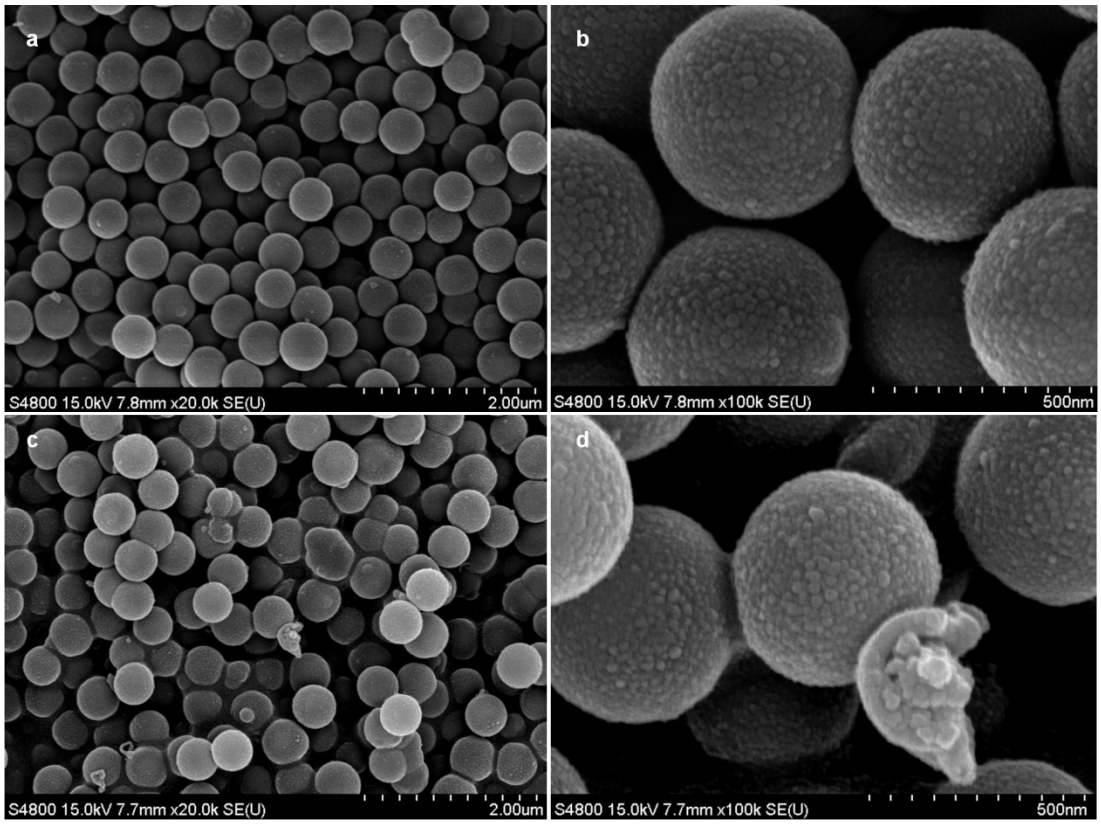

Fig. S7. SEM images of fresh Er:Y_2O_3-2@SiO_2@mTiO_2 (a and b) and recycled Er:Y_2O_3-2@SiO_2@mTiO_2 (c and d).

Reference

1. S. Hilgenfeldt, S. Grossmann and D. Lohse, *Nature*, 1999, **398**, 402-405.