Electronic Supplementary Information

Facile preparation of $ZnGa_2O_4$ photonic crystals with enhanced light absorption and photocatalytic activity

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Experimental section

Preparation of Polystyrene Spheres: Monodisperse polystyrene spheres with various sphere sizes were synthesized using a typical emulsion polymerization according to the literature. Typically, 100 mL of ultrapure water (18 MΩ/cm^2 @ 25 °C) and a certain amount of styrene were added into a three-necked, round-bottomed flask (250 mL). The mixture was stirred at 500 rpm, while being heated to 70 °C and purged with nitrogen gas with a flow rate of 100 mL/min. After the mixture was kept at 70 °C for 20 min, 0.1 g of $K_2S_2O_8$ was added and the reaction lasted for 12 h. The resulting polystyrene spheres were centrifuged at 8000 rpm to remove any large agglomerates in the bottom and then the remained polystyrene spheres were centrifuged at 12000 rpm to remove small spheres in the upper liquid. The obtained precipitates were redispersed in 100 mL of water to form a colloidal polystyrene spheres suspension until needed. In the present study, monodisperse polystyrene spheres with various sphere sizes were produced by changing the amount of styrene, keeping all other experimental conditions the same.

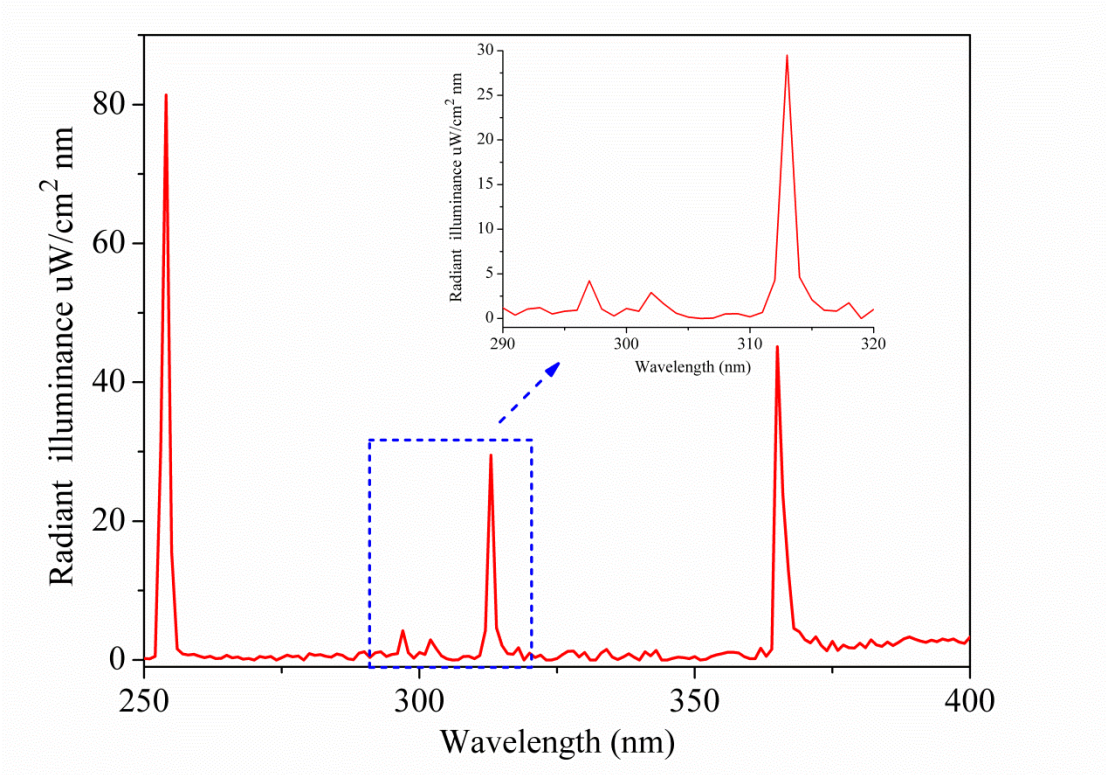

Fig. S1 The spectrum of the UV light (center wavelength λ = 254 nm).

Table 1 The UV band output of UV light (center wavelength λ = 254 nm).

Band / nm	UVC(220-280)	UVB(281-320)	UVA(321-390)
Output / cm^{-2} uw	137.9	77.9	169.5

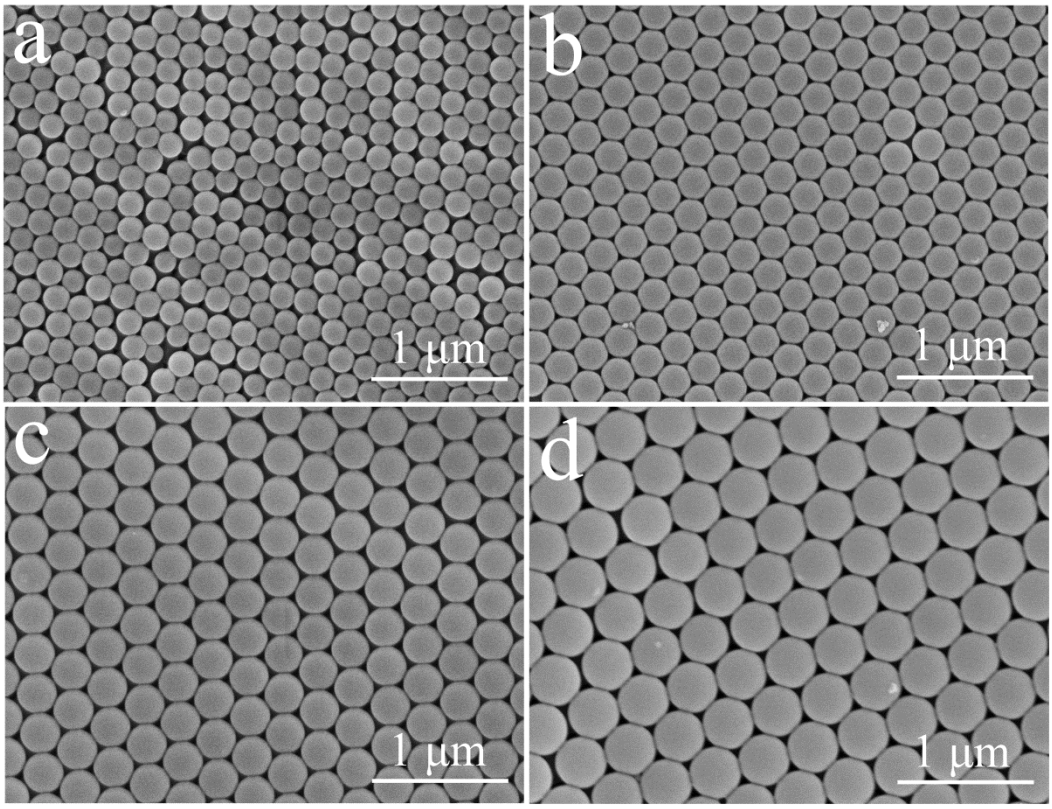

Fig. S2 SEM images of the as-prepared PS sphere templates with different sphere diameters: (a) 190 nm, (b) 240 nm, (c) 300 nm, (d) 380 nm.

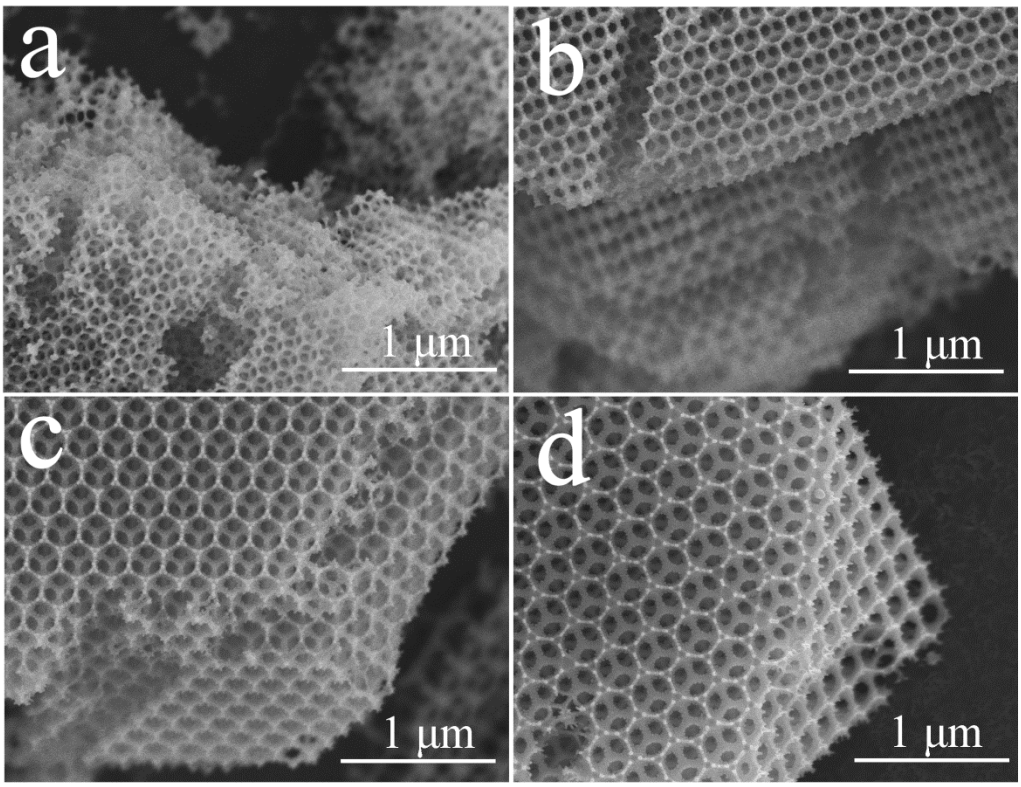

Fig. S3 Cross-sectional SEM images of the $ZnGa_2O_4$ PCs with different pore diameters prepared at 500 ^oC: (a) ZG PCs/145, (b) ZG PCs/180, (c) ZG PCs/225, and (d) ZG PCs/280.

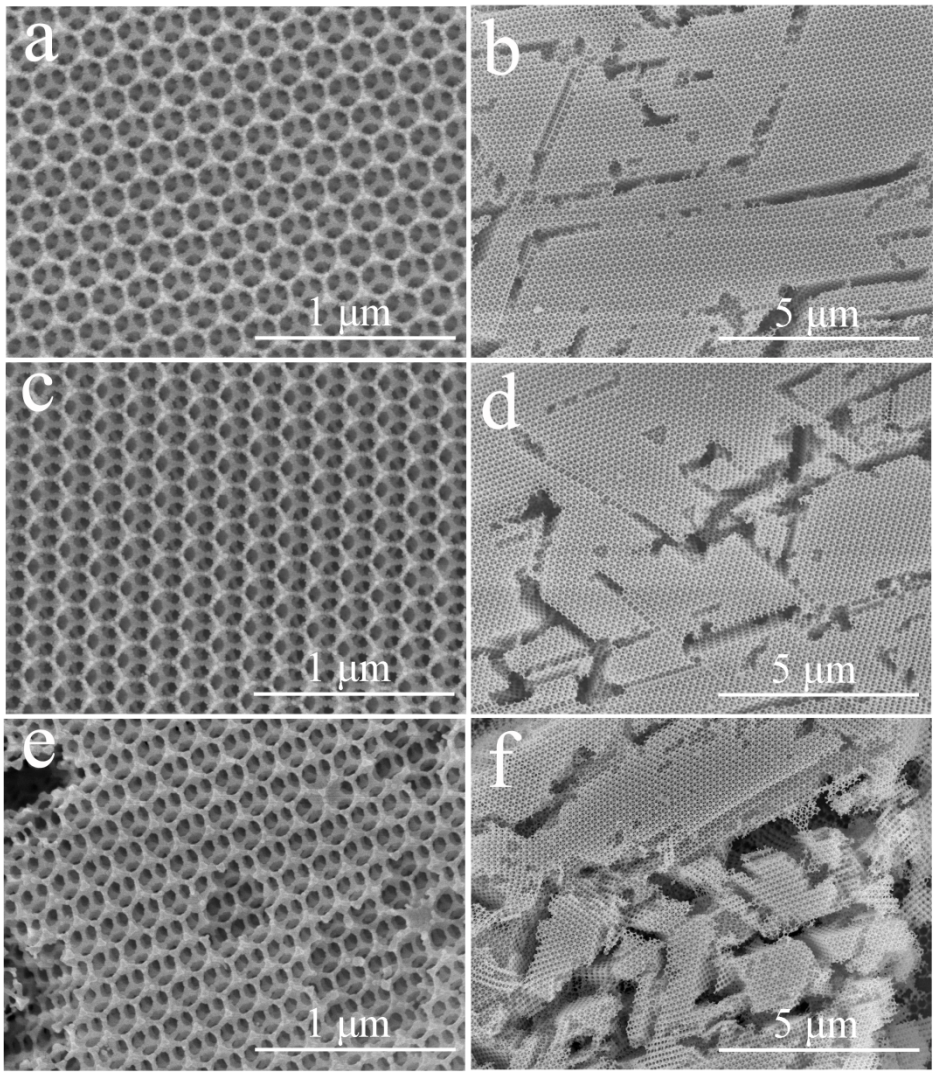

Fig. S4 SEM images of the sample ZG PCs/180 prepared at different temperatures: (a, b) 400 °C, (c, d) 500 °C and (e, f) 600 °C.

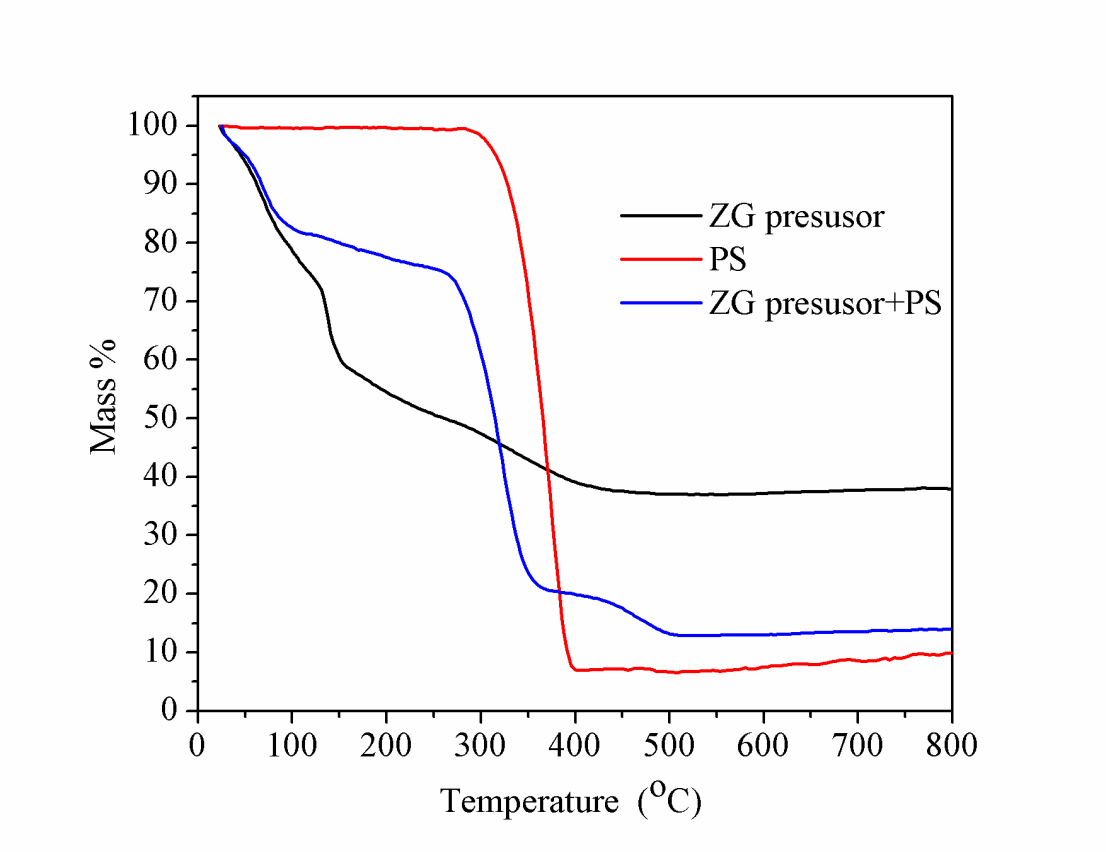

Fig. S5 TG analysis of the amorphous complex precursor, the PS sphere template and the precursor infiltrated PS spheres template.

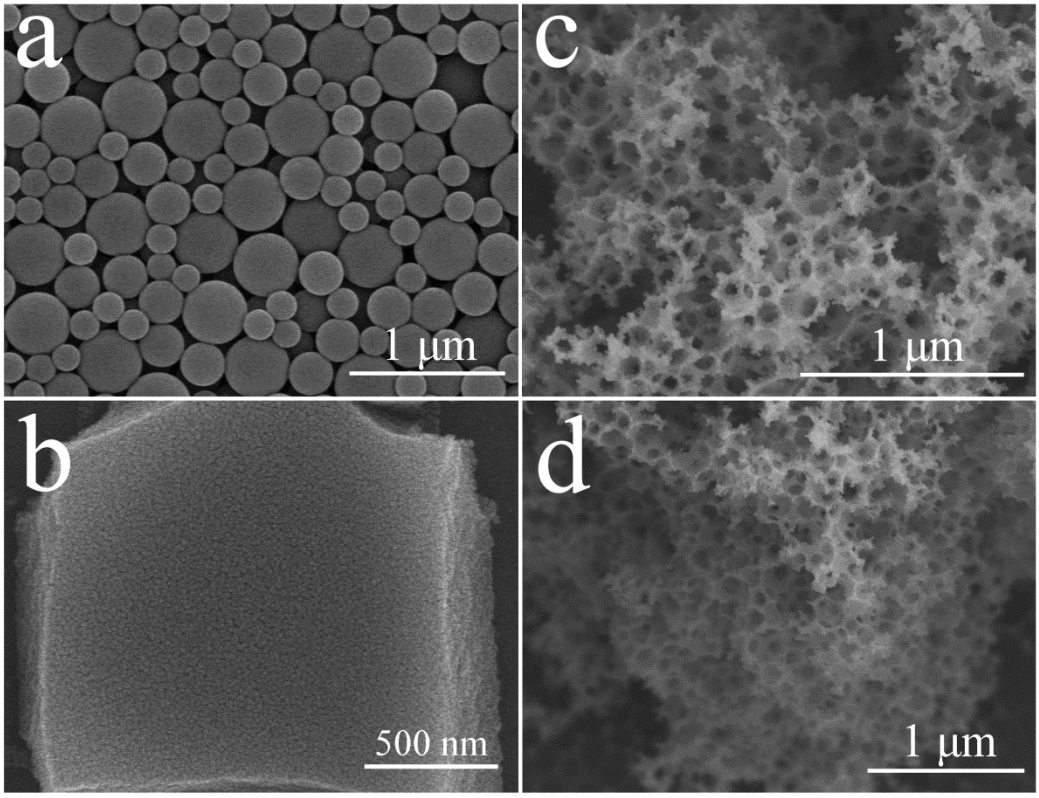

Fig. S6 SEM images of (a) disordered PS sphere template, (b) sample ZG NCs and (c, d) sample ZG/mix.

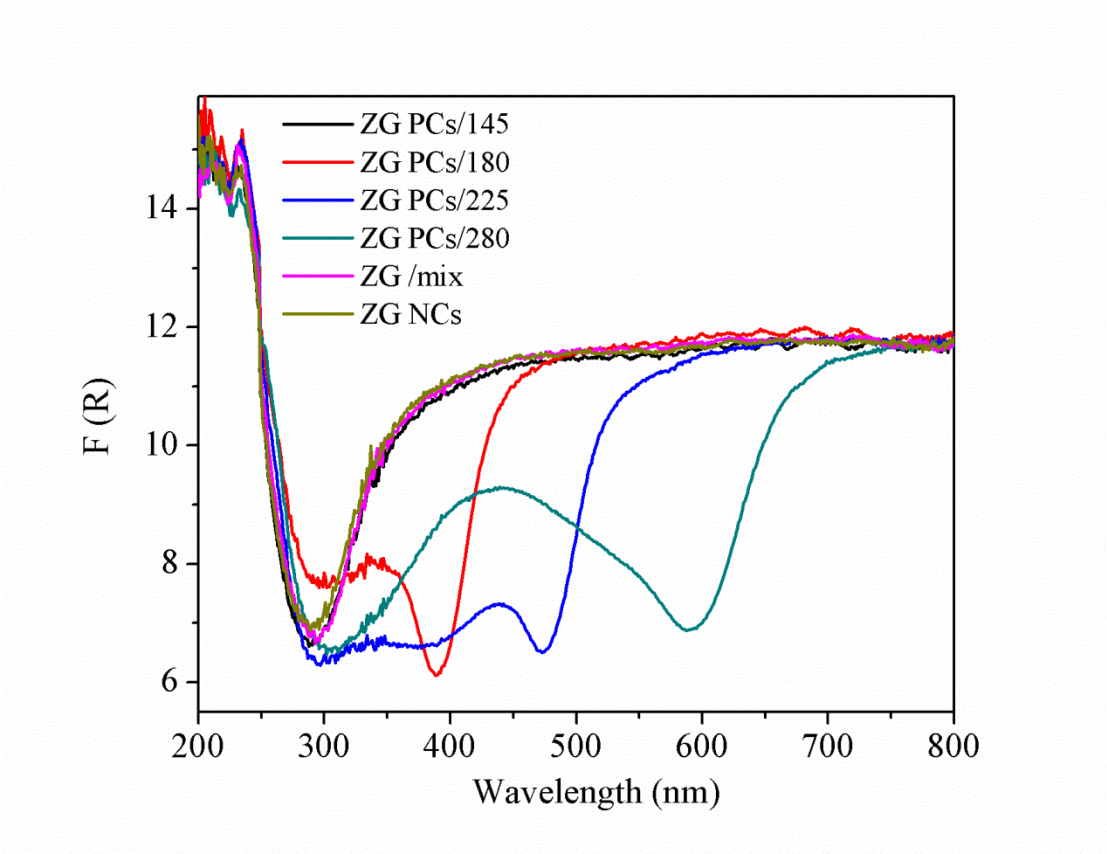

Fig. S7 Absorption spectra of the as-prepared $ZnGa_2O_4$ PCs

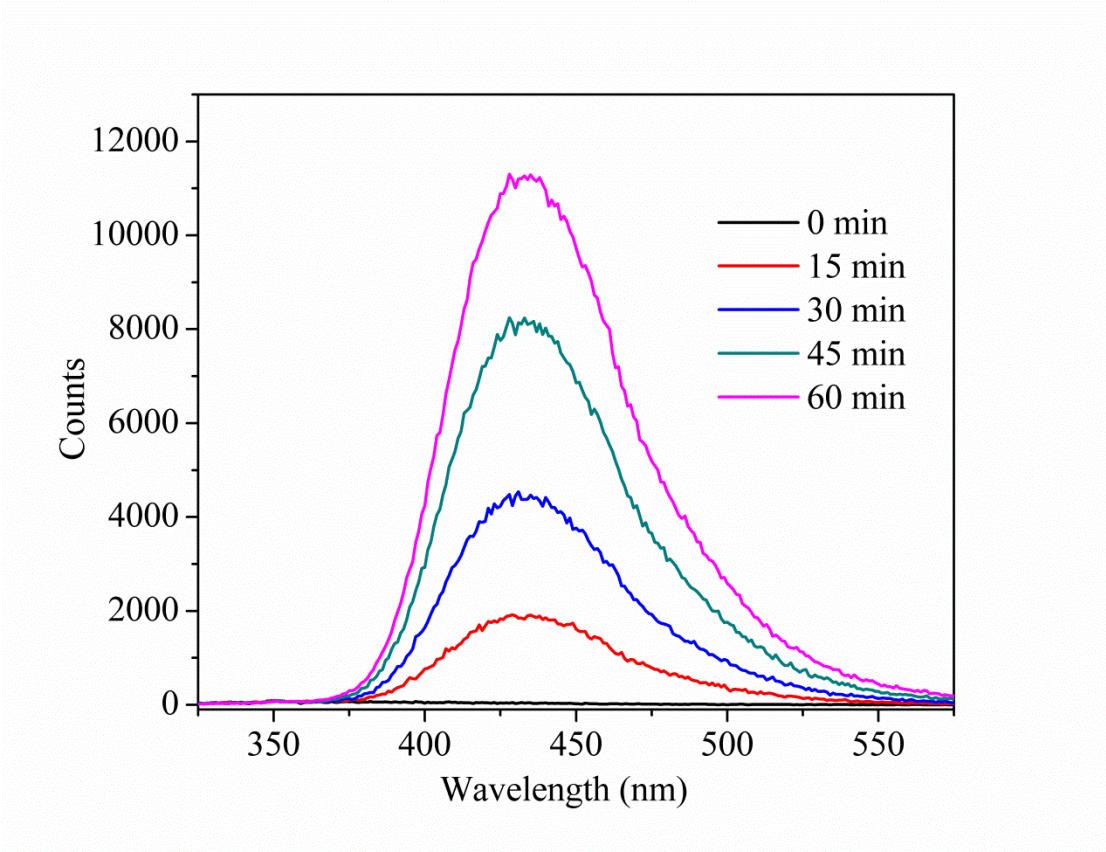

Fig. S8 The ·OH-trapping PL spectra of the TA aqueous solution in the presence of sample ZG PCs/180.