

Supplementary Information

❖ Details of equipment

The morphology of the synthesized photocatalyst was examined by Field Emission Scanning Electron Microscope (FESEM, JEOL JSM 6490-A). *HORIBA Scientific* (Jobin Yvon *Fluoro Log 3*), France, *macro PL system* was used to record the photoluminescence spectra of bare and Ce³⁺ modified ZnO powders at 325 nm excitation wavelength. The emissions were recorded from 350-650 nm. The powder XRD patterns of synthesized photocatalysts were recorded by Xpert x-ray powder diffractometer (Philips PW1398) with Cu *Kα* radiation source from 20° to 80° (2θ) with a step time of 3 seconds and step size of 0.05°. Scherer's equation was applied on main reflections to evaluate the crystallite size of various phases. High performance liquid chromatograph (HPLC) (SPD-20A, Shimadzu Corporation, Japan). A 60:40 Methanol-Water mixture as solvent, c18 column and 254 nm detector wavelength was selected for analysis. Thermo scientific, USA, ion chromatograph, Dionex (ICS-5000 + EG Eluent Generator), was used to measure the released ions during photocatalytic process. TOC-VCPH total carbon analyzer supplied by Shimadzu Corporation, Japan, measured total Organic Carbon (TOC) of the samples. Selected samples were analyzed by GC-MS (Shimadzu Corporation, Japan, Shimadzu-QP2010 Plus) equipped with RtX1 capillary column, for the identification of unknown compounds formed as intermediate during the mineralization process using Helium (He) as carrier gas.

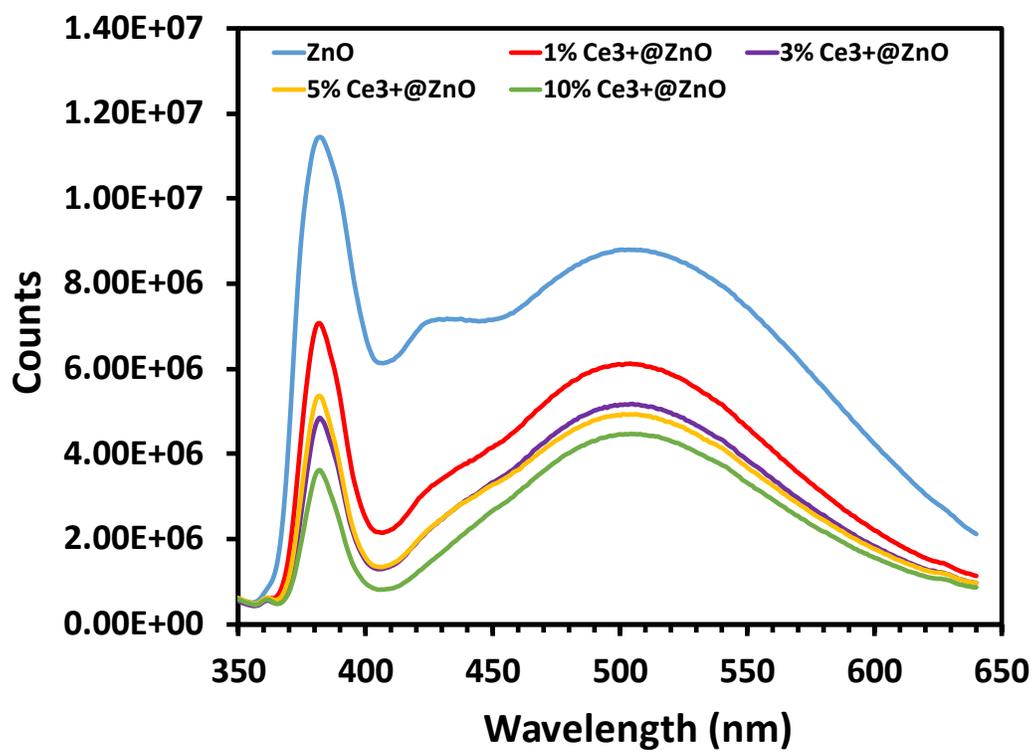


Fig. S1. The comparison of the PL spectra of pure and synthesized Ce³⁺ impregnated ZnO.

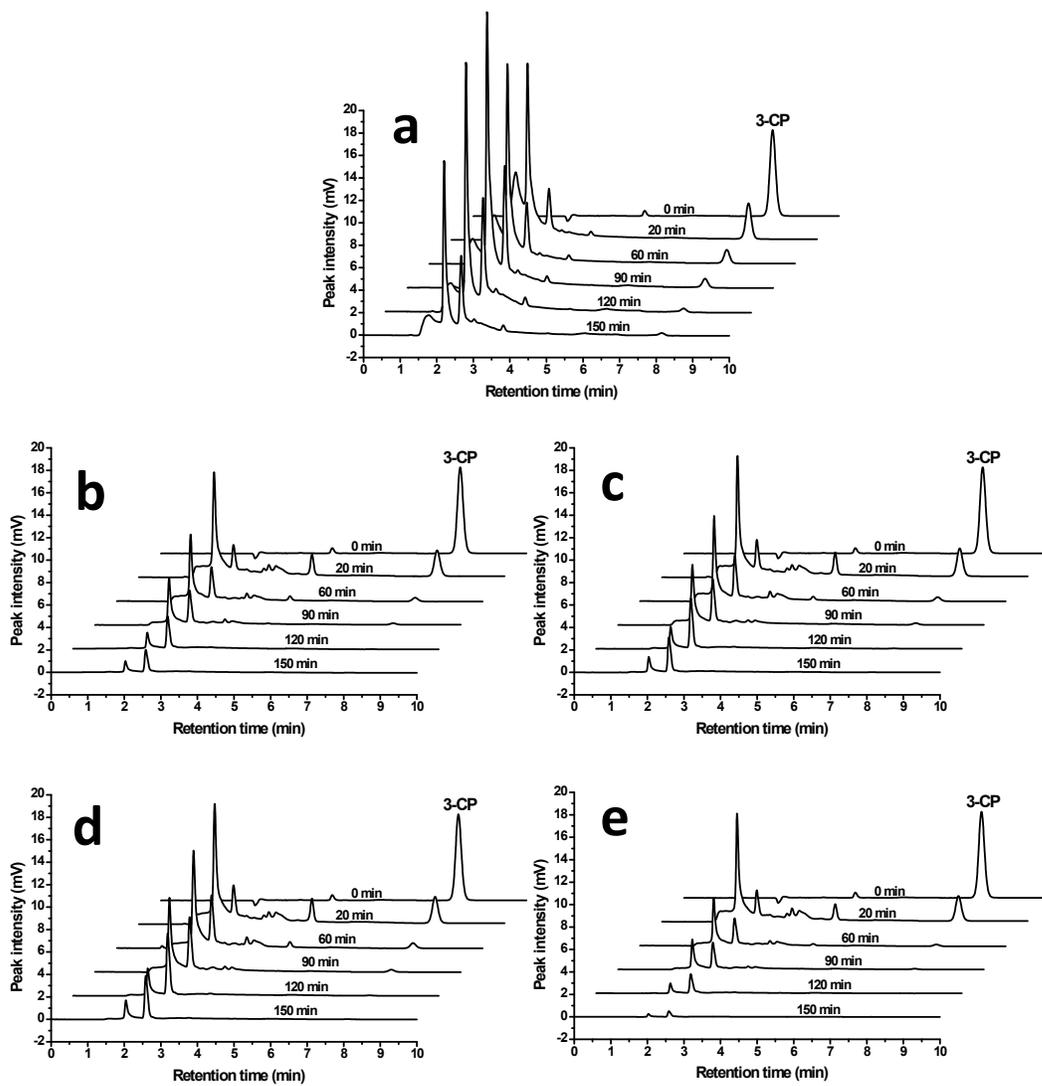


Fig. S2. The comparison of the HPLC profiles for the degradation of 3-CP (a) pure ZnO (b) 1%Ce³⁺@ZnO (c) 3%Ce³⁺@ZnO (d) 5%Ce³⁺@ZnO and (e) 10%Ce³⁺@ZnO.

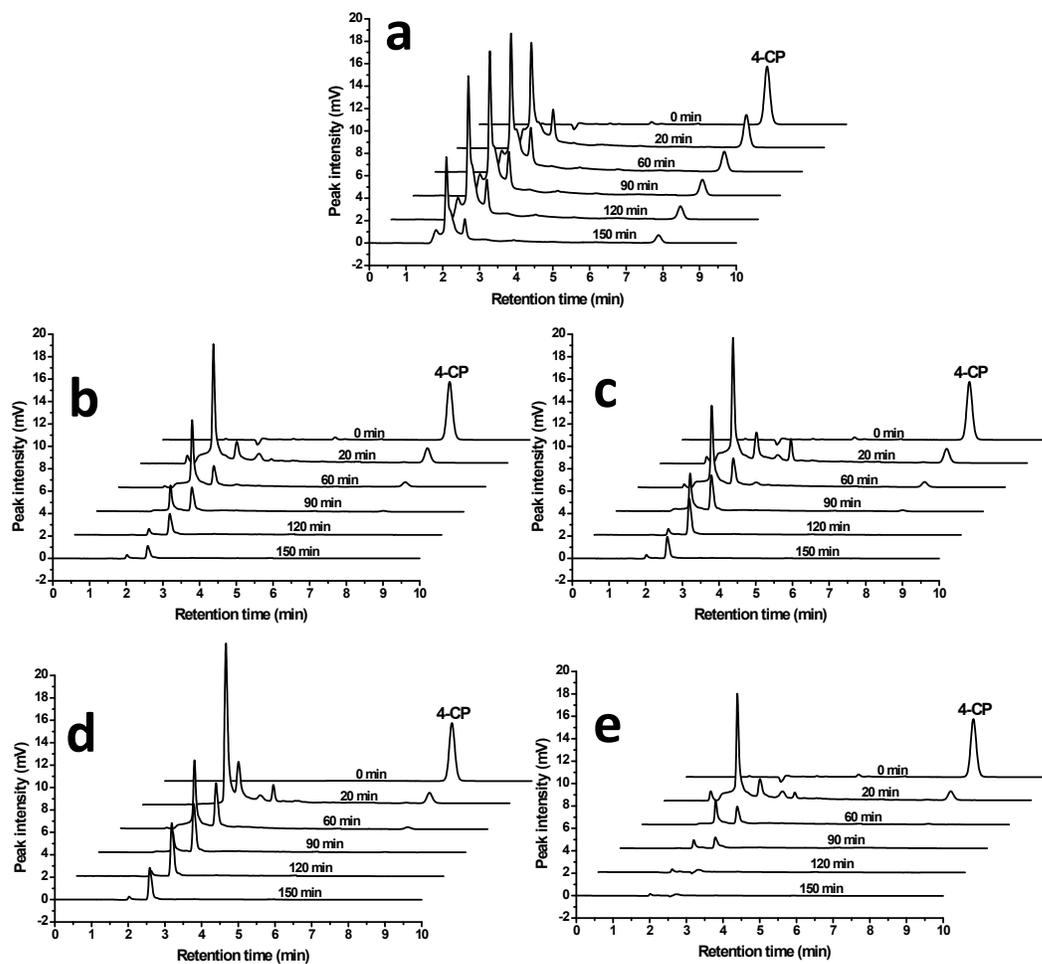


Fig. S3. The comparison of the HPLC profiles for the degradation of 4-CP (a) pure ZnO (b) 1%Ce³⁺@ZnO (c) 3%Ce³⁺@ZnO (d) 5%Ce³⁺@ZnO and (e) 10%Ce³⁺@ZnO

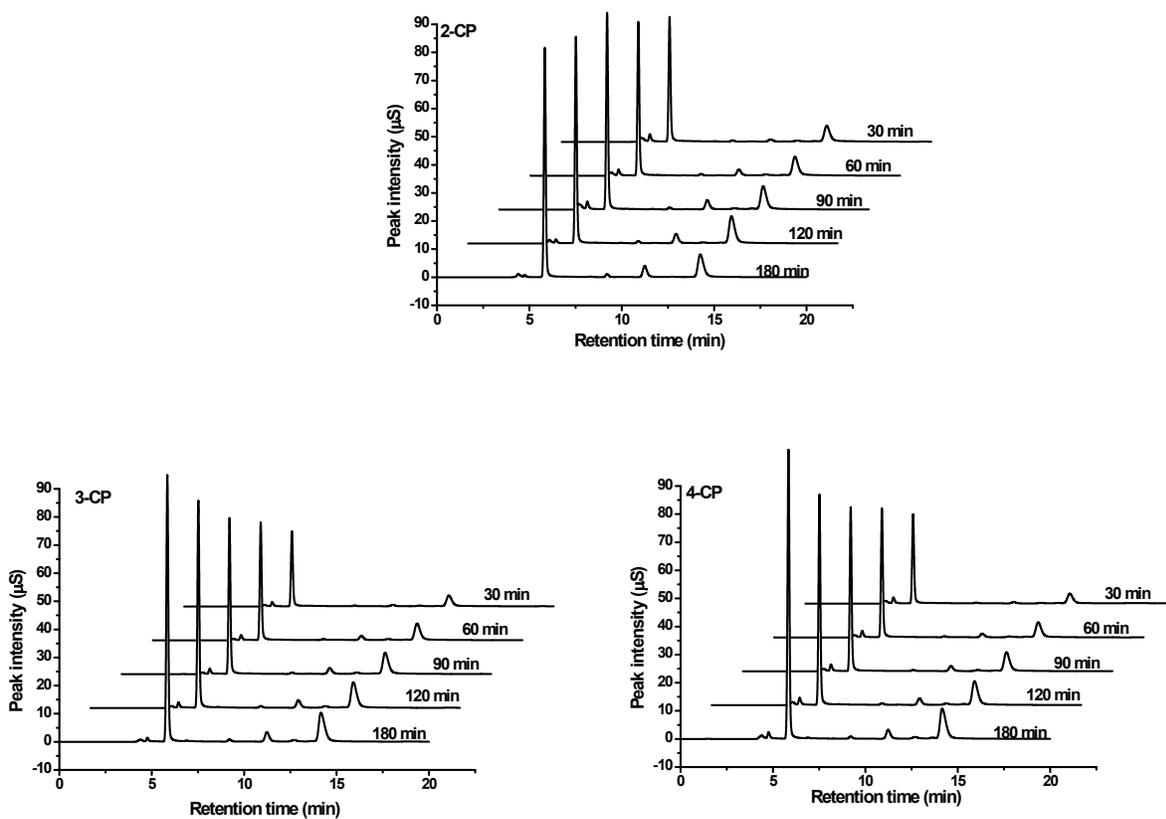


Fig. S4. The comparison of IC profiles for the release of anions in the solution for the degradation of 2-CP, 3-CP and 4-CP (50 ppm) over 1%Ce³⁺@ZnO in sunlight exposure.