# Supporting Information: In-Depth Structural and Optical Analysis of Ce-modified ZnO Nanopowders with Enhanced Photocatalytic Activity Prepared by Microwave Assisted Hydrothermal Method

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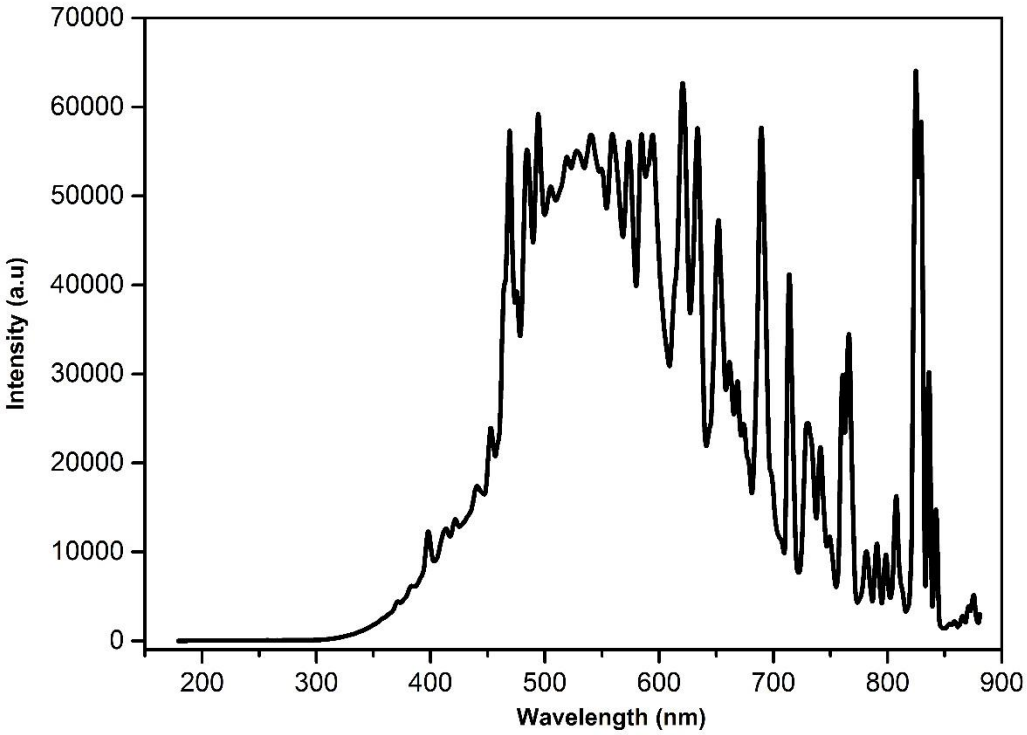



**Figure S1.** Emission spectrum of Xenon lamp utilized within the present study.

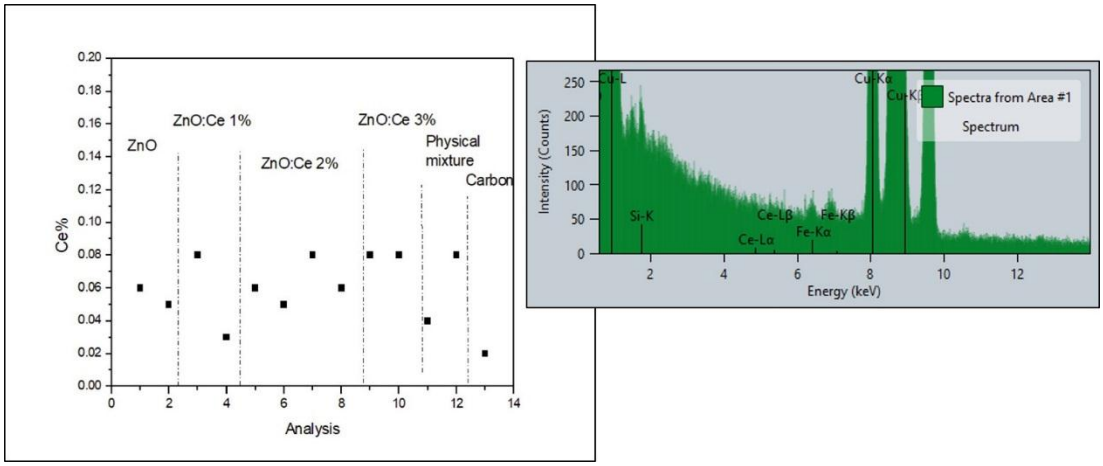



**Figure S2.** (**a**)The graph shows the atomic percentages of cerium present in apparently cerium-free zones of samples ZnO, ZnO: Ce1%, ZnO: Ce2%, ZnO: Ce3%, and a sample prepared as a reference

consisting in a physical mixture of $CeO_2$ and ZnO (with 2% atomic loading of cerium). An analysis performed in a holey carbon area of the grids free of sample is also considered. All loads, including those acquired in an unmodified ZnO sample, are less than 0.1%. As can be seen in the expanded spectrum shown in image (**b**), acquired in an area of the ZnO:Ce 2% sample, which shows an atomic cerium content of 0.06%, there is only noise at the position at which the cerium peaks should appear.

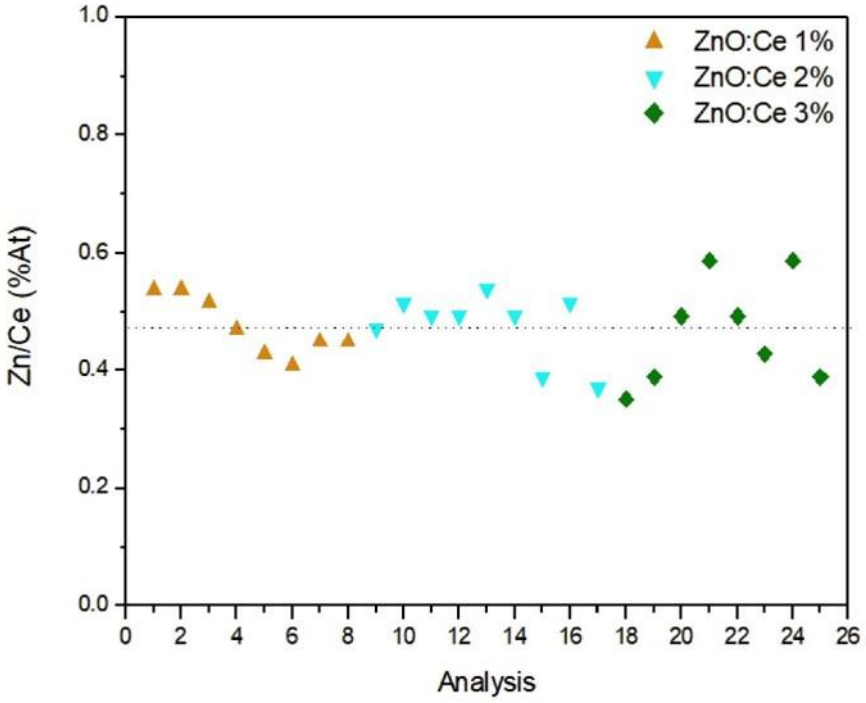



**Figure S3** The graph shows 25 analyses of the atomic Zn/Ce ratio in cerium-rich areas of the three samples modified with different amounts of cerium. The dotted line corresponds to the mean value of 0.47, which corresponds to a composition of the mixed oxide $Ce_{0.68}Zn_{0.32}O_x$.

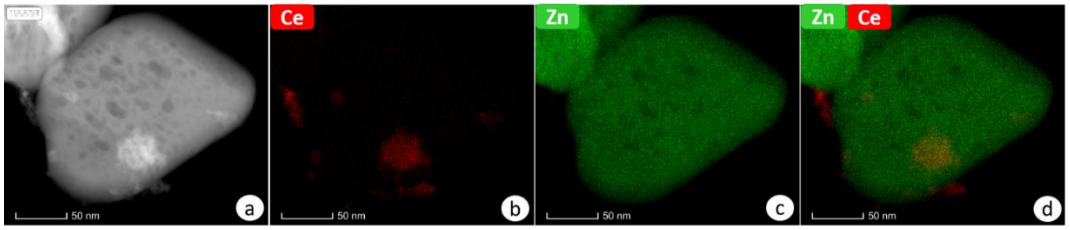



**Figure S4.** Sample ZnO-Ce 1% (**a**) HAADF-STEM image, XEDS elemental maps showing the spatial distribution of (**b**) Ce, (**c**) Zn and (**d**) both elements together corresponding to the area displayed in (**a**)

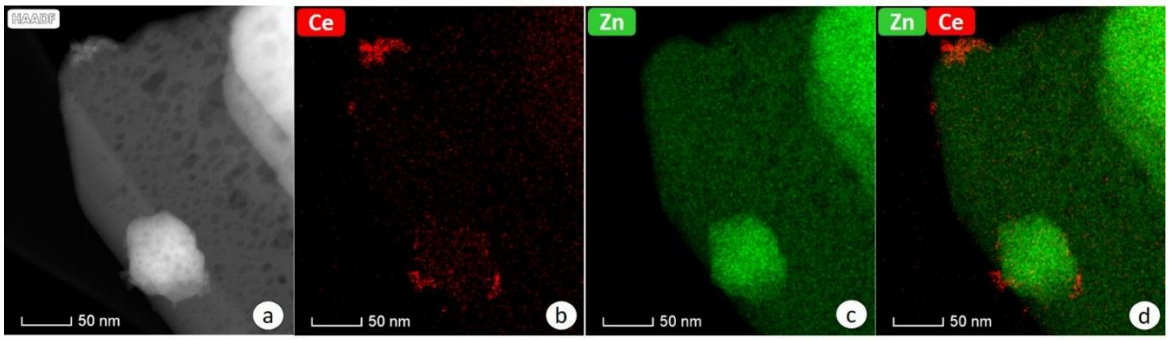



**Figure S5.** Sample ZnO-Ce 2% (**a**) HAADF-STEM image, XEDS elemental maps showing the spatial distribution of (**b**) Ce, (**c**) Zn and (**d**) both elements together corresponding to the area displayed in (**a**)

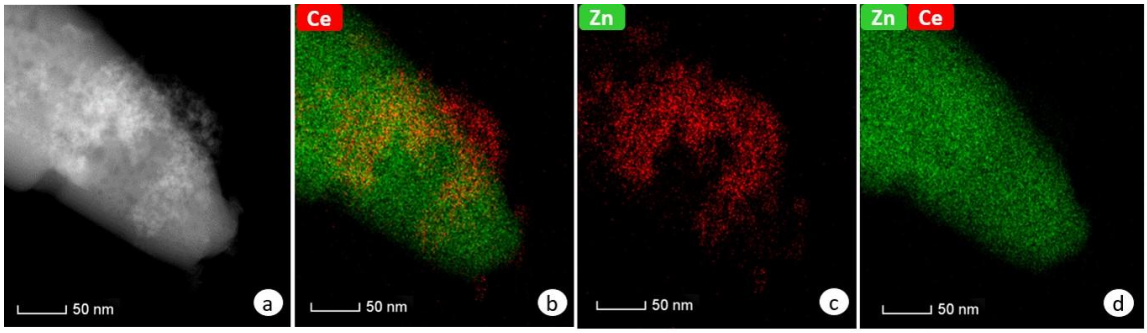
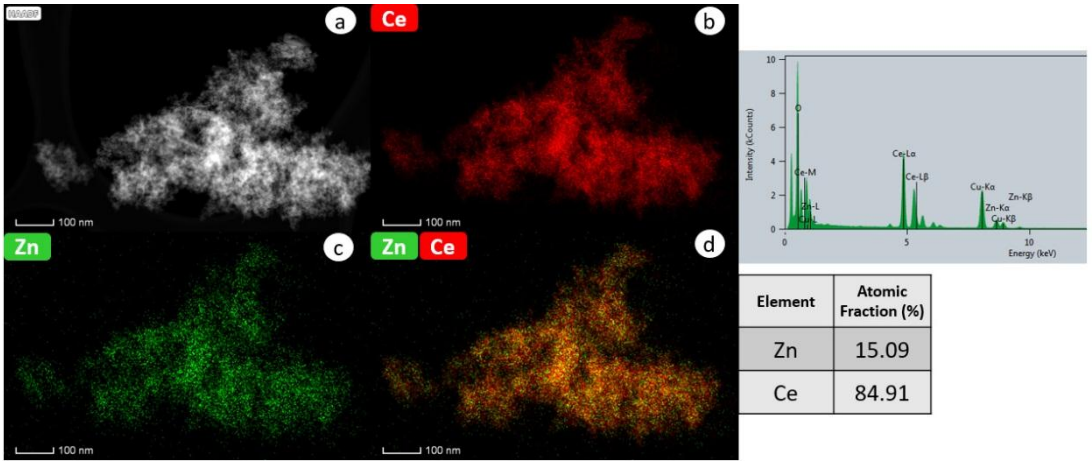



**Figure S6.** Sample ZnO-Ce 3% (**a**) HAADF-STEM image, XEDS elemental maps showing the spatial distribution of (**b**) Ce, (**c**) Zn and (**d**) both elements together corresponding to the area displayed in (**a**)




| Element | Atomic Fraction (%) |
|---|---|
| Zn | 15.09 |
| Ce | 84.91 |

**Figure S7.** STEM -HAADF images of the sample at low magnification showing the major polycrystalline aggregates together with ZnO nanoflakes.

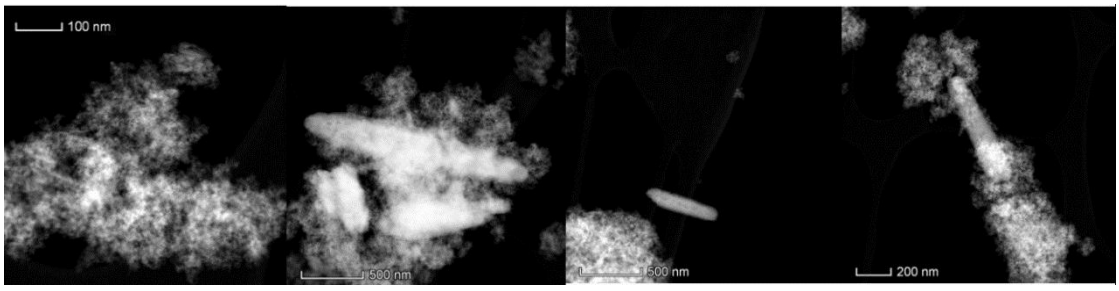


**Figure S8.** Sample ZnO-$Ce_{0.68}Zn_{0.32}O_x$ XEDS elemental maps showing the spatial distribution of (**b**) Ce, (**c**) Zn and (**d**) both elements together corresponding to the area displayed in (**a**).

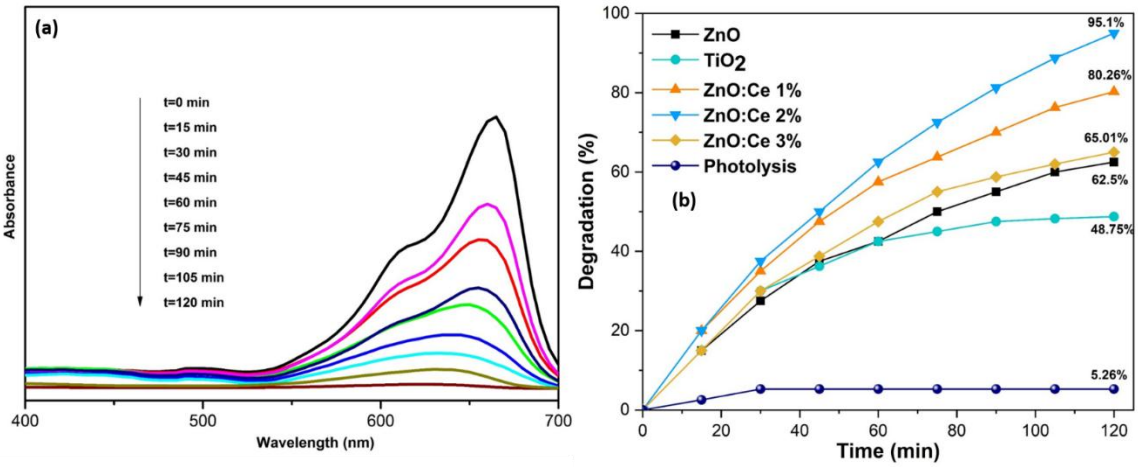



**Figure S9.** (**a**) Absorbance spectra of MB aqueous solution in the presence of ZnO: Ce 2% photocatalyst at increasing irradiation times. (**b**) photodegradation vs irradiation time of different samples.

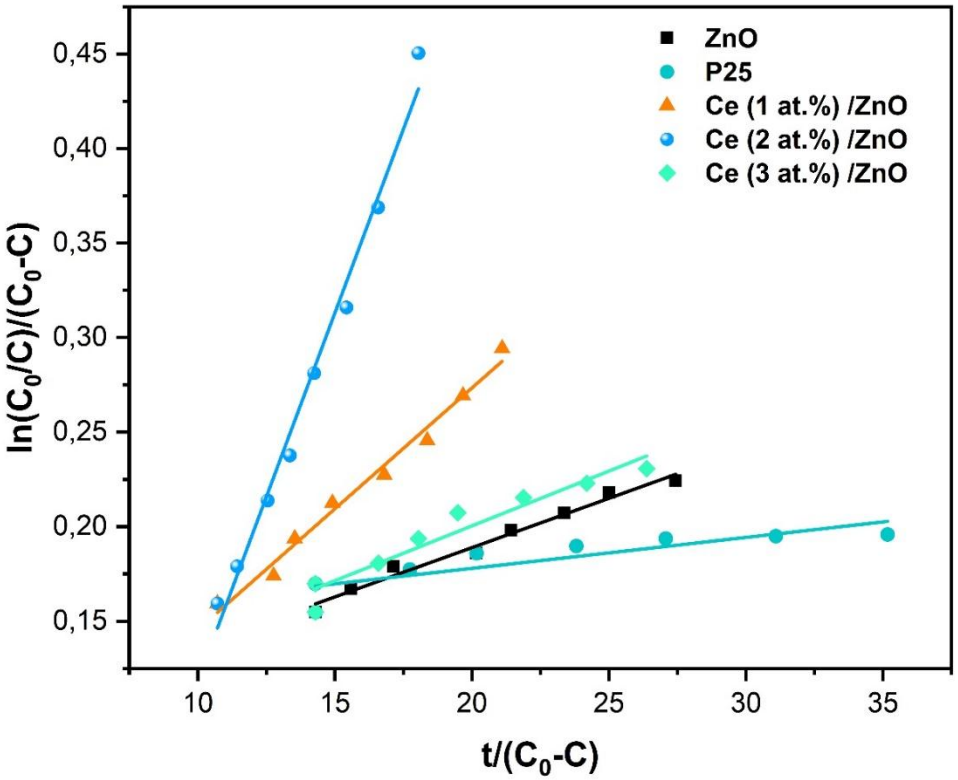



**Figure S10.** L-H plots of MB degradation by Ce/ZnO and P25 photocatalysts.