Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.


# Electronic Supplementary Information

## Designed Ag-decorated Mn:ZnO nanocomposite: Facile synthesis, enhanced visible light absorption and photogenic carrier separation

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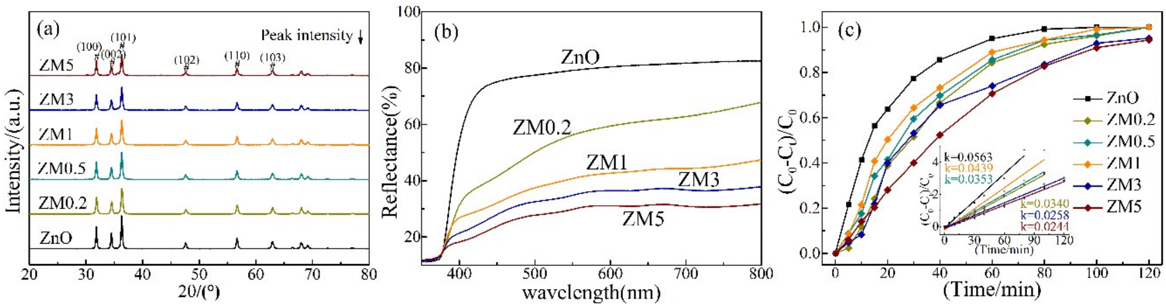


**Figure S1.** (a) XRD patterns of Mn-doped ZnO with different Mn content in the range 20-80°. (b) The UV-vis diffuse reflectance spectrum of as-prepared Mn-doped ZnO with different Mn content. (c) Photodegradation of MB with as-synthetized Mn doped ZnO with different Mn content under simulated sunlight irradiation.

The Mn-doped ZnO NPs with different Mn concentrations were successfully produced by the facile polymer network gel method. Obtained Mn-doped ZnO were characterized by X-Ray diffraction (XRD) to investigate the phases and components of as-prepared series of catalysts, as shown in **Figure S1a** and **Table S2.** With the increase of Mn concentration, the crystal quality of catalyst gradually deteriorate due to the lattice disorder as the diverse ionic radius. The UV-vis diffuse reflection spectrum of as-prepared samples is provided in **Figure S1b**. And the photocatalytic properties of the as-prepared samples were evaluated by the degradation of MB aqueous solutions upon exposure to the simulated sunlight irradiation is shown in **Figure S1c**. The introduction of manganese obviously enhanced the visible absorption of ZnO but does not improve its photocatalytic performance, the highest catalytic activity of Mn-doped

ZnO NPs achieves with the 1mol% Mn concentration, which is similar to Yadollah's report[S1]. In addition, it was found in our previous study that Ag-decorated ZnO photocatalyst had the best activity removing organic pollutants such as methylene blue (MB), methyl orange (MO) and rhodamine B (RhB) in aqueous solution when the Ag modification amount was 3 mol%[S2,28]. Therefore, the content of Ag deposition used by a facile polymer network gel method this paper kept 3mol%.

**Table S1** The main reagent dosages used in synthetic processes of ZnO, Mn:ZnO, Ag/ZnO and Mn:ZnO/Ag composites

| samples | $Zn(NO_3)_2\cdot 6H_2O$/g | $Mn(NO_3)_2\cdot 4H_2O$/g | $AgNO_3$/g |
|---|---|---|---|
| ZnO | 6.0099 | NONE | NONE |
| Mn:ZnO | 5.9498 | 0.0512 | NONE |
| Ag/ZnO | 5.8296 | NONE | 0.1021 |
| Mn:ZnO/Ag | 5.7695 | 0.0512 | 0.1021 |

Materials and reagents required for this experiment, including $Zn(NO_3)_2\cdot 6H_2O$, , $AgNO_3$, $Mn(NO_3)_2\cdot 4H_2O$, glucosum anhydricum, tartaric acid, acrylamide, N, N'-methylene diacrylamide. All reagents were of analytical grade and used without further purification.

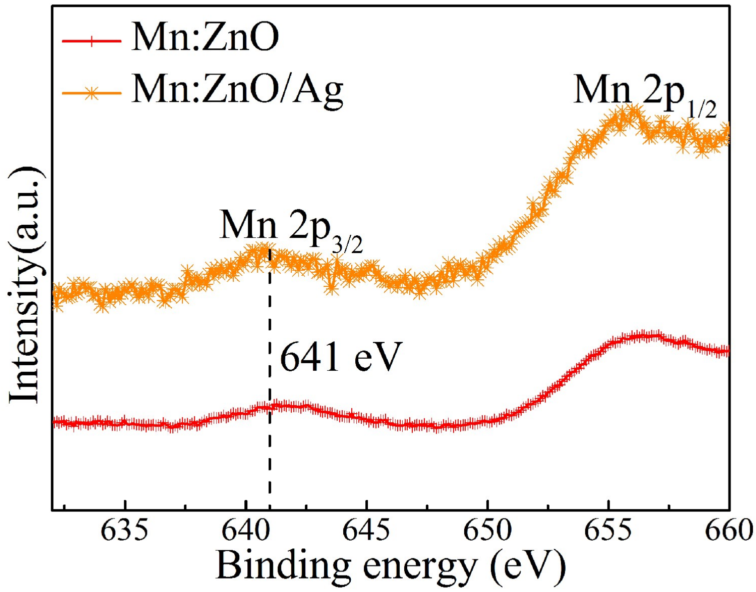


**Figure S2**. The high-resolution Mn 2p XPS spectra.

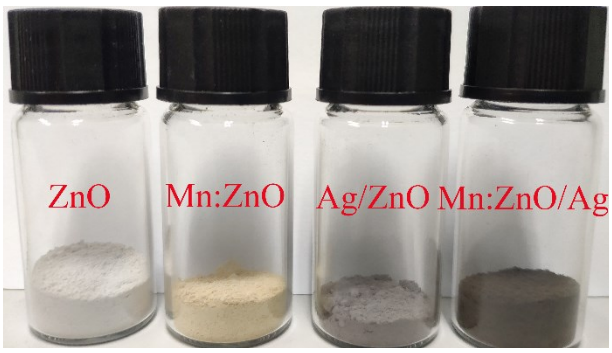


**Figure S3.** The color transformation of as-synthesized samples.

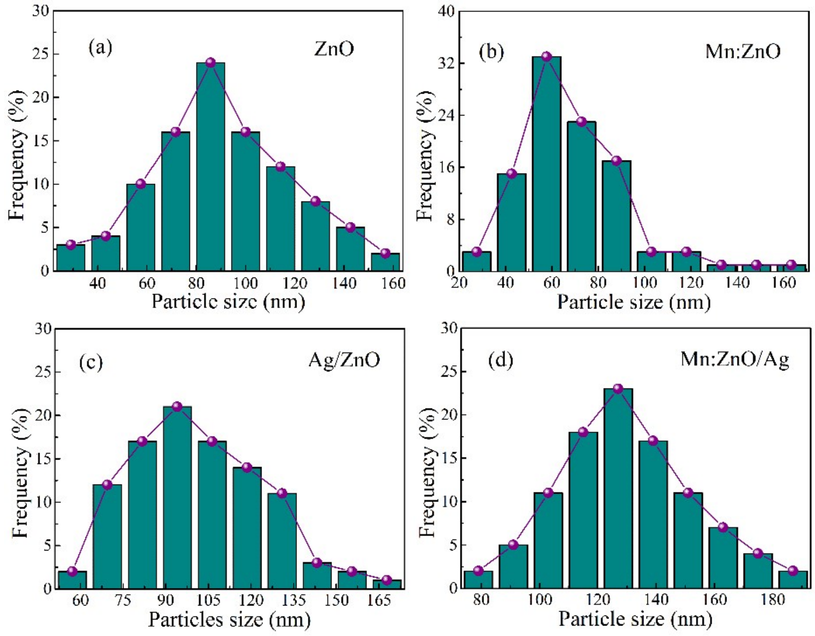


**Figure S4.** Particle size distribution of pure ZnO, Mn:ZnO, Ag/ZnO and Mn:ZnO/Ag NPs.

**Table S2.** Average particle size of pure ZnO, Mn:ZnO, Ag/ZnO and Mn:ZnO/Ag NPs.

| Samples | ZnO | Mn:ZnO | Ag/ZnO | Mn:ZnO/Ag |
|---|---|---|---|---|
| Average particle size (nm) | 90.42 | 69.31 | 101.22 | 129.83 |

## References

[S1] A Yadollah, A Abdul, Z Zulkarnain, Y Nor, Synthesis and Characterization of Manganese Doped ZnO Nanoparticles, Int. J. Basic Appl. 11 (2011) 1361.

[S2] Y H Lu, Xu M, Xu L X, Enhanced ultraviolet photocatalytic activity of Ag/ZnO nanoparticles synthesized by modified polymer-network gel method, Journal of Nanoparticle Research. 17 (2015) 350.