Electronic Supplementary Information

A green biomimetic preparation of efficient Ag-ZnO heterojunctions with excellent photocatalytic performance under solar light irradiation: A novel biogenic-deposition-precipitation approach

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Optimization of FSE required for the biogenic preparation of Ag-ZnO composites

To optimize the amount of fennel seeds extract required for the preparation of AgNPs onto the ZnO surface, biosynthesis of 1wt% Ag-ZnO nanocomposite was carried out at different mixing ratios (9:1, 8:2 and 7:3 v/v) of the 1mM $AgNO_3$ to FSE without varying other conditions and analyzed using diffuse reflectance spectroscopy as shown in Fig. S1. In all the samples, a strong absorption edge at around 389 nm due to the ZnO semiconductor and a broader absorption band around 450 nm in the visible range was observed, which is attributed to the local surface plasmon resonance (LSPR) absorption of silver. Further, it has been observed that, with an increase in the amount of fennel seeds extract (from 9:1 to 8:2 v/v; $AgNO_3$:FSE), the intensity of SPR absorption around 450 nm increases. This increase in intensity of absorption can be attributed to increase in number density of AgNPs, due to the reduction reaction between silver ions and polyphenolic compounds of fennel seeds. However, further increasing the amount of seeds extract, there is no substantial increase in the intensity of absorption, which suggest that excess of phytochemical has little effect on synthesis of nanoparticles. The appropriate maximum absorbance was observed with 8:2 v/v; $AgNO_3$:FSE ratio. Further preparations were carried out with this mixing combination.

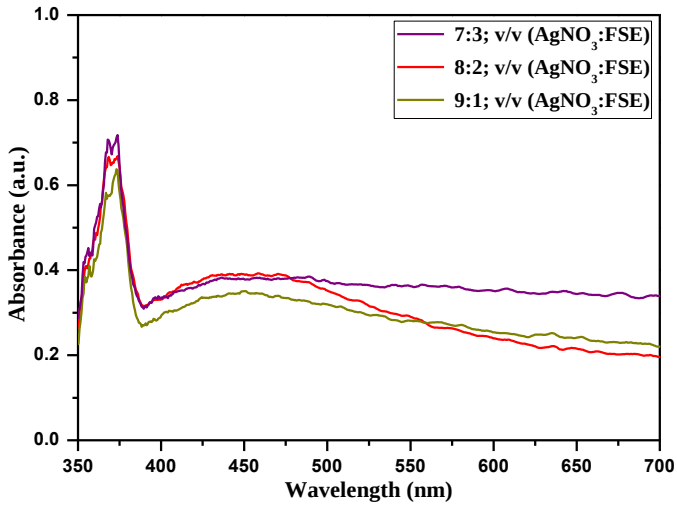

Fig. S1. Diffuse reflectance spectra of Ag-ZnO prepared using different concentration ratios of AgNPs and FSE

EDX spectra and elemental composition of biogenically prepared 1 and 3 wt% Ag-ZnO

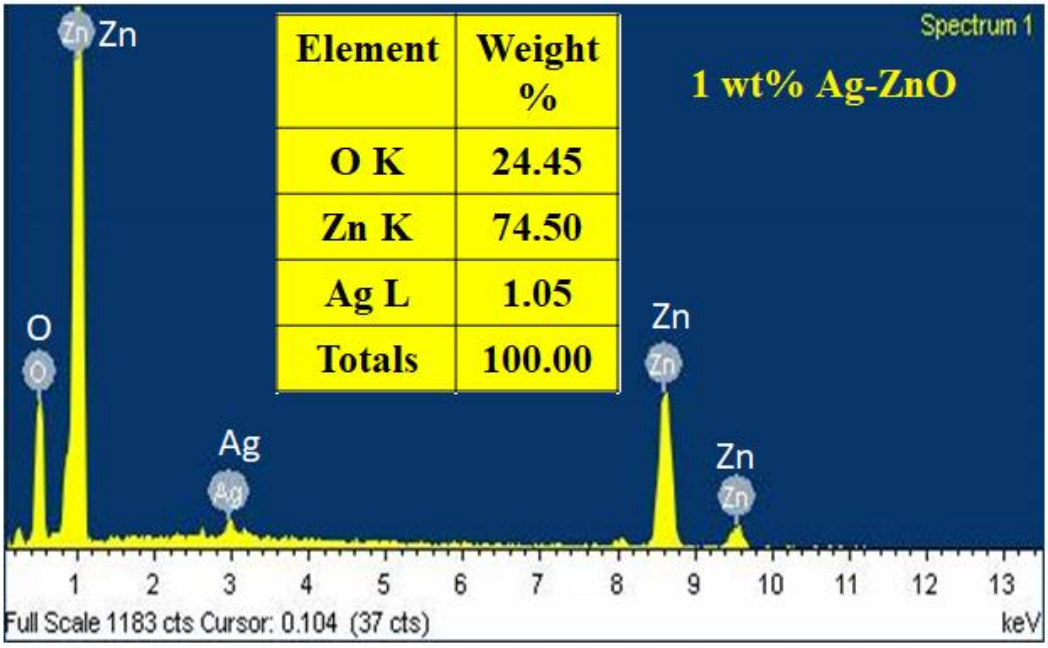

Fig. S2. EDX spectra and elemental composition (inset) of 1 wt% Ag-ZnO prepared biogenically using FSE

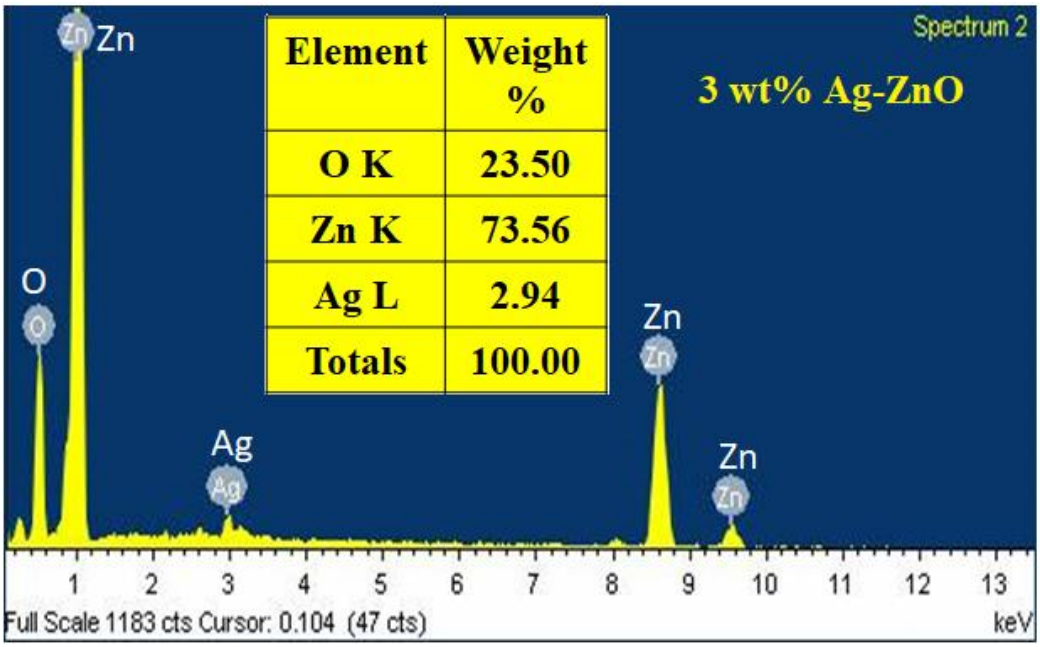

Fig. S3. EDX spectra and elemental composition (inset) of 3 wt% Ag-ZnO prepared biogenically using FSE

Photocatalytic degradation of Rh-B dye using pure ZnO, 1 and 3 wt% Ag-ZnO

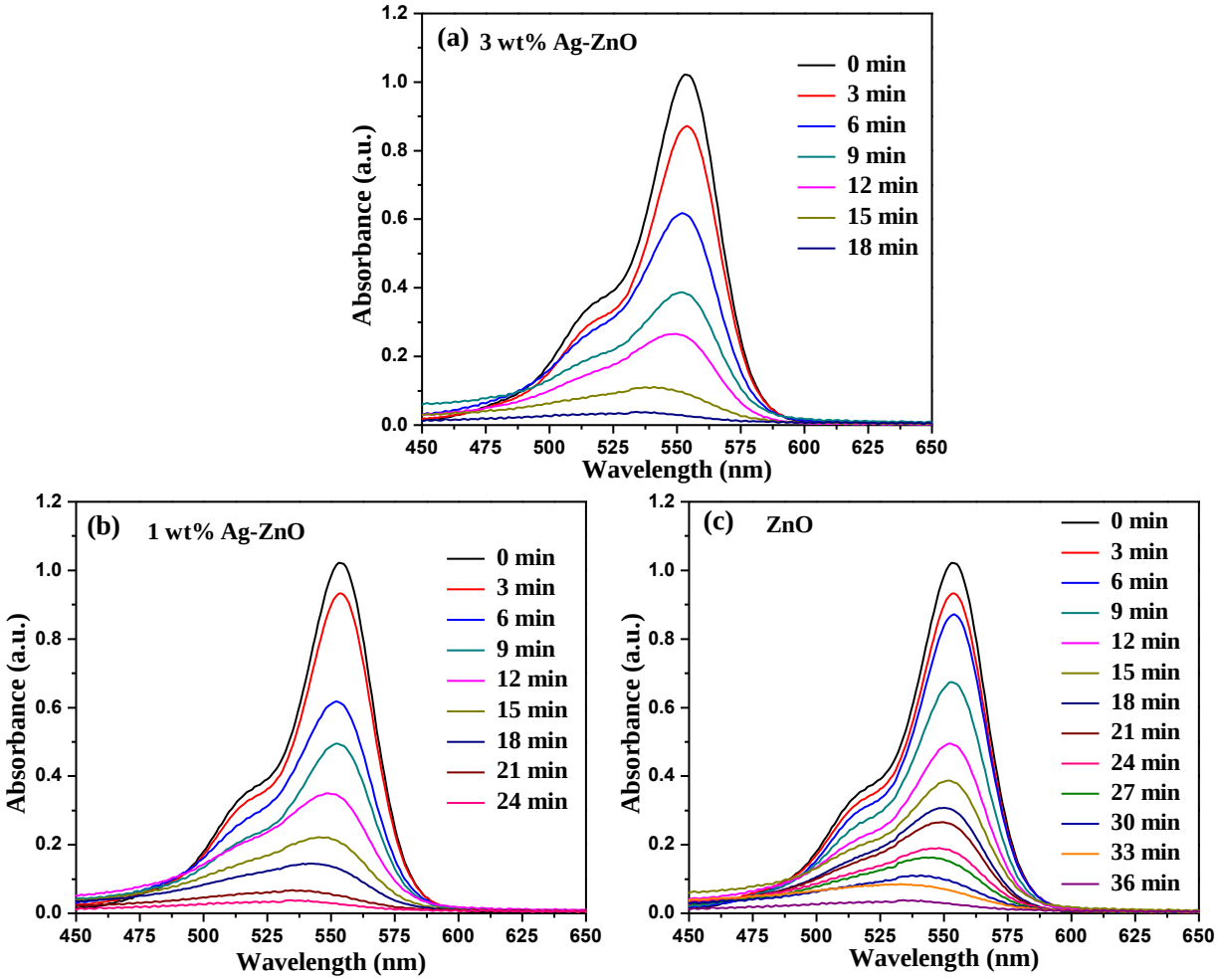

Fig. S4. UV-visible spectra of photodegradation of Rh-B dye under visible light irradiation using **(a)** 3 wt% Ag-ZnO, **(b)** 1 wt% Ag-ZnO and **(c)** pure ZnO

Photocatalytic degradation of Chlorpyrifos pesticide using pure ZnO, 1 and 3 wt% Ag-ZnO

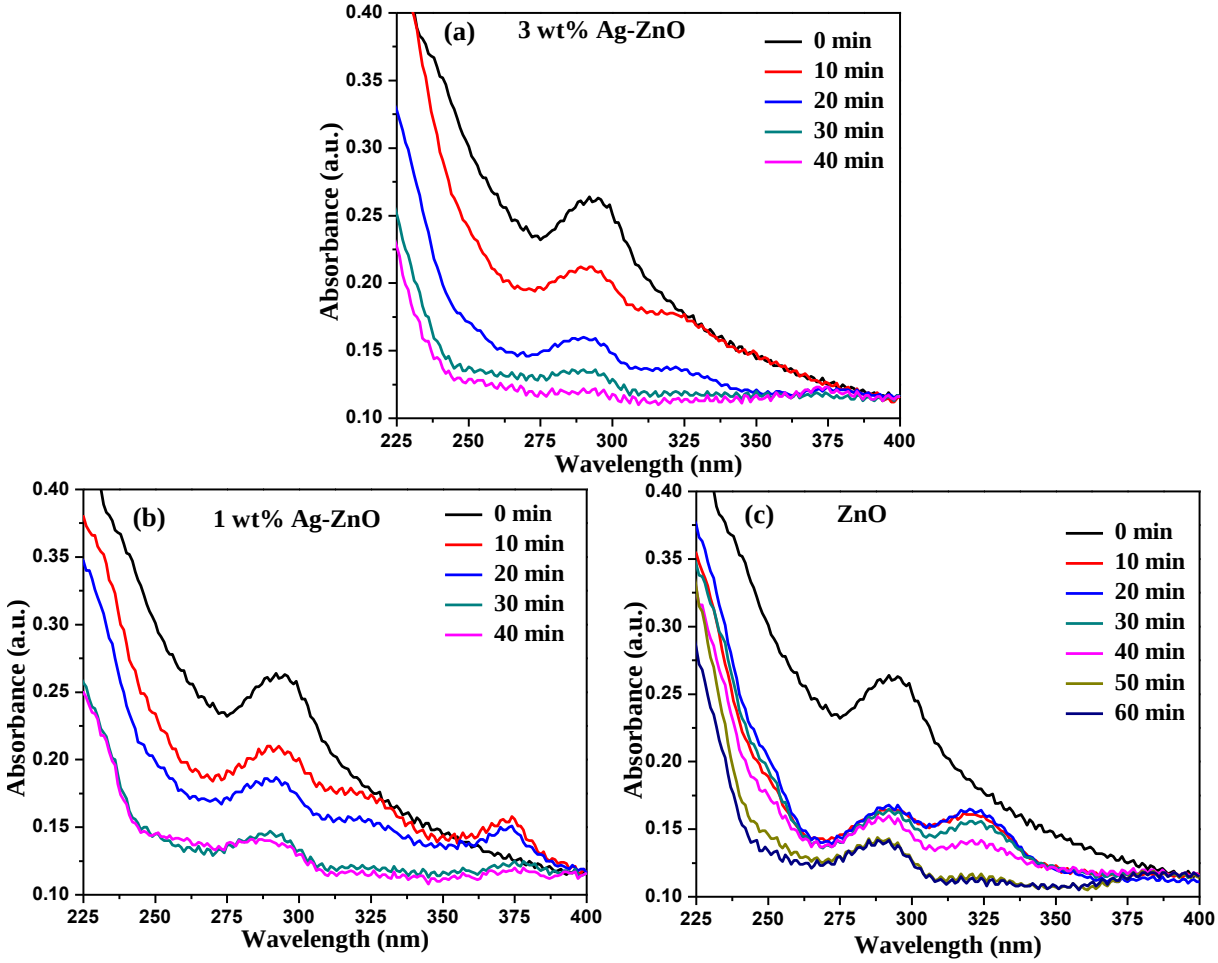

Fig. S5. UV-visible spectra of photodegradation of Chlorpyrifos pesticide under visible light irradiation using **(a)** 3 wt% Ag-ZnO, **(b)** 1 wt% Ag-ZnO and **(c)** pure ZnO