Electronic supplementary material

Highly efficient catalytic/sonocatalytic reduction of 4-nitrophenol and antibacterial activities through bifunctional Ag/ZnO nanohybrid material made-up via sodium alginate method

Hicham Abou Oualid\textsuperscript{a,b}, Othmane Amadine\textsuperscript{a}, Younes Essamlali\textsuperscript{a}, Issam Meftah Kadmiri\textsuperscript{c}, Hicham El Arroussi\textsuperscript{c}, Mohamed Zahouily\textsuperscript{a,b,*}

\textsuperscript{a} VARENA Center, MAScIR Foundation, Rabat Design, Rue Mohamed El Jazouli, Madinat El Irfane 10100-Rabat, Morocco.
\textsuperscript{b} Laboratoire de Matériaux, Catalyse et Valorisation des Ressources Naturelles, URAC 24, FST, Université Hassan II-Casablanca BP, 146, 20650, Morocco.
\textsuperscript{c} Green Biotechnology Center, Moroccan Foundation for Advanced Science, Innovation and Research, Rabat Design Center, Rabat, Morocco

*Correspondence: m.zahouily@mascir.com; Tel. +212661416359

Fig. A1: TGA of Alg@Zn@Ag\textsubscript{1} (a), Alg@Zn@Ag\textsubscript{2} (b) and Alg@Zn@Ag\textsubscript{3} (c) under air.
Fig. A2: Photo of the Alg@Zn@Ag beads (a) and (b) Ag/ZnO powder.

Fig. A3: FTIR analysis of pure zinc oxide fabricated by the same procedure.
Fig. A4: N$_2$ adsorption-desorption (isotherms) and BJH pore size distribution of Ag$_{0.84}$/ZnO (a, b), Ag$_{1.68}$/ZnO (c, d) and Ag$_{2.98}$/ZnO (e, f), respectively.
**Fig. A5:** UV–Vis spectra evolution of solutions of 4-NP in the presence of NaBH₄ in different concentration of 4-NP.

**Fig. A6:** UV–Vis spectra evolution of solutions of 4-NP in the presence of NaBH₄ in different mass concentrations of Ag/ZnO catalyst.
Fig. A7: UV–Vis spectra evolution of solutions of 4-NP in the presence of NaBH₄ in different R ratio.