Supporting Information

Ag-CuO-ZnO Metal-semiconductor Multiconcentric Nanotubes for Superior and Perdurable Photodegradation

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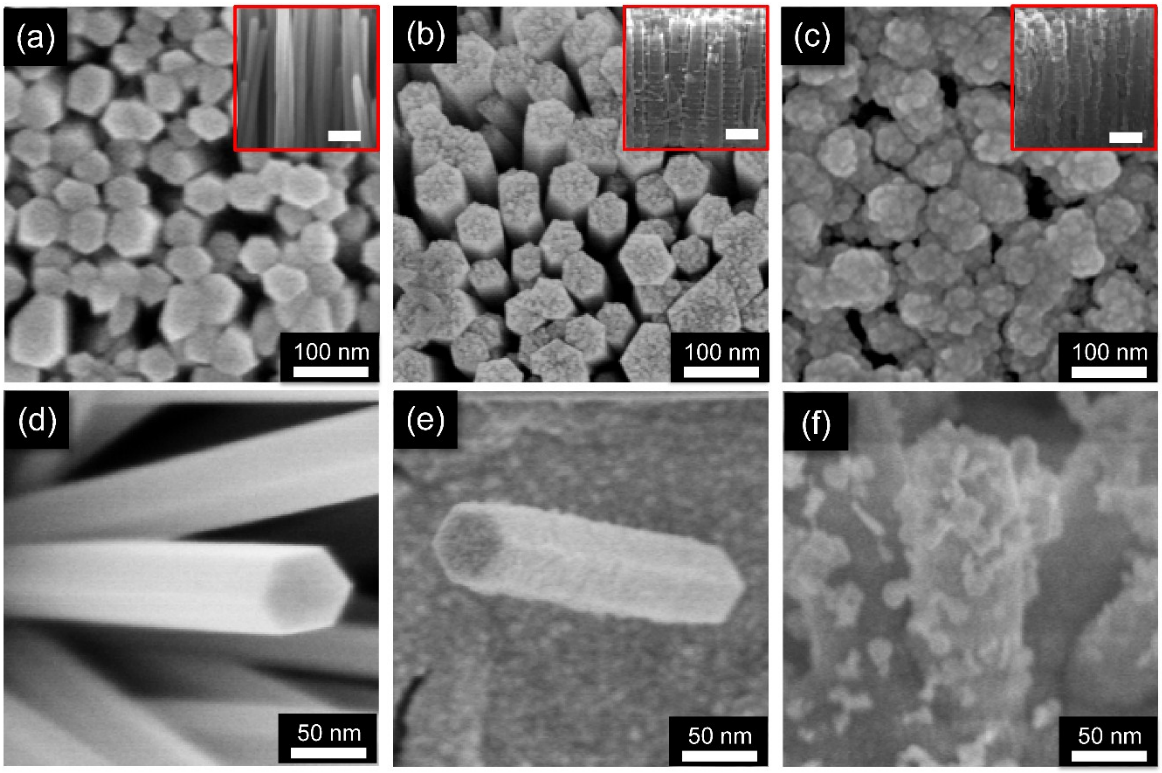

Figure S1. SEM images of (a) & (d) ZnO NRs, (b) & (e) binary CuO-ZnO NRs composite, (c) & (f) ternary Ag-CuO-ZnO NRs composite. The insets in (a-c) are the cross-section images of the corresponding products. The scale bars of the insets (a-c) are 50 nm.

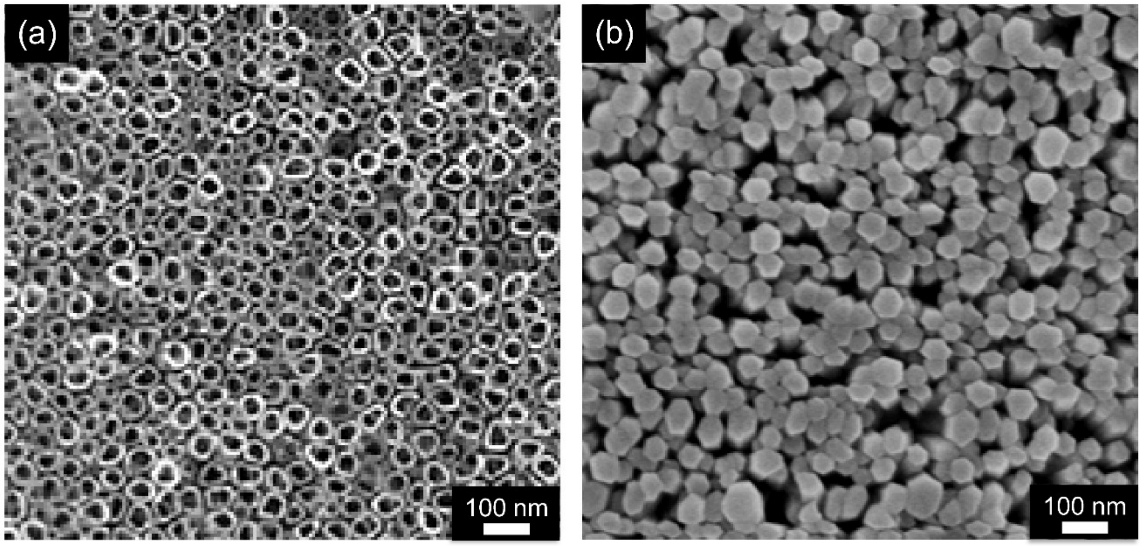

Figure S2. SEM images of large-area (a) ZnO NTs and (b) ZnO NRs.

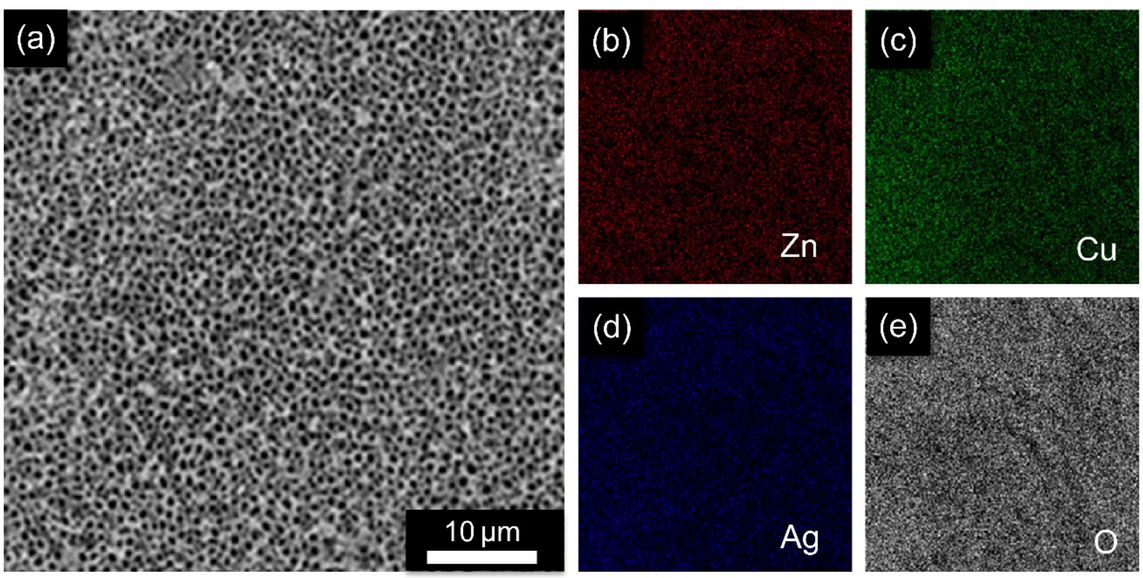

Figure S3. Elemental mapping results of the ternary Ag-CuO-ZnO NTs composite.

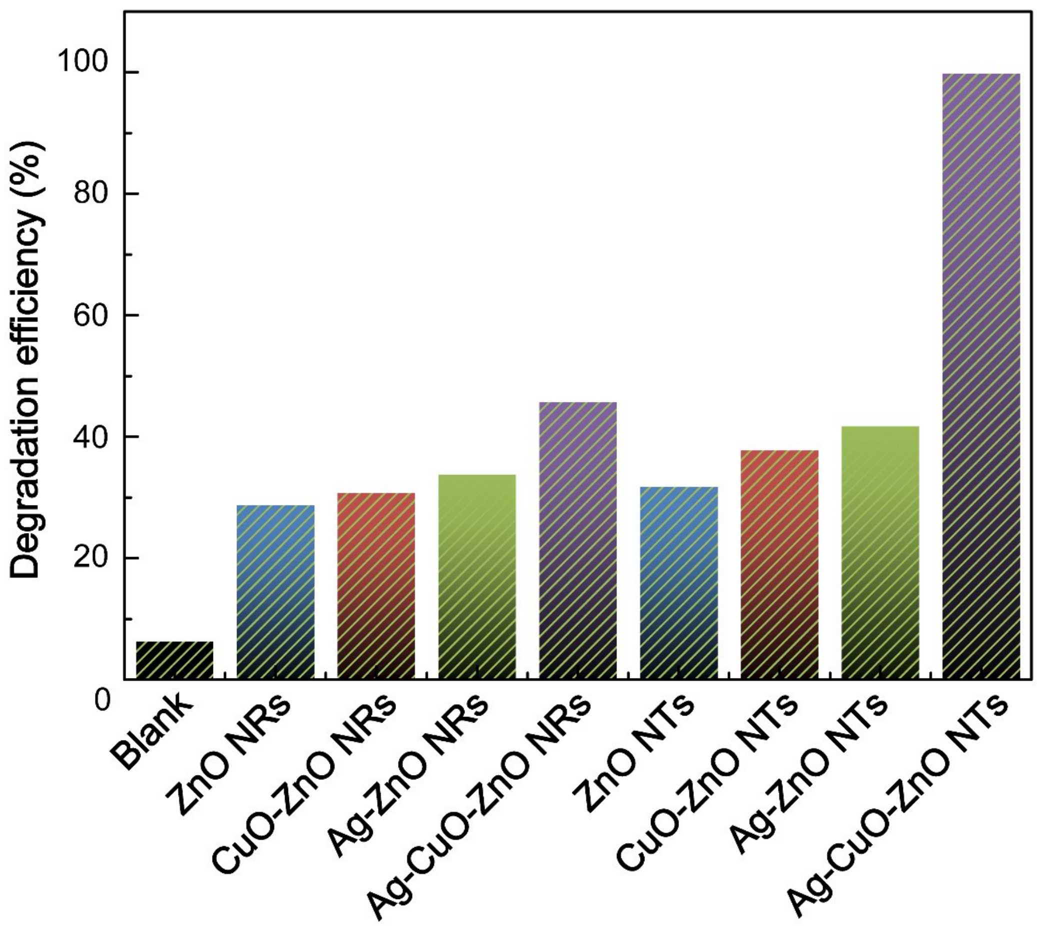

Figure S4. Different photocatalysts to degrade MO, including ZnO NRs, CuO-ZnO NRs, Ag-ZnO NRs, Ag-CuO-ZnO NRs, ZnO NTs, CuO-ZnO NTs, Ag-ZnO NTs and Ag-CuO-ZnO NTs.

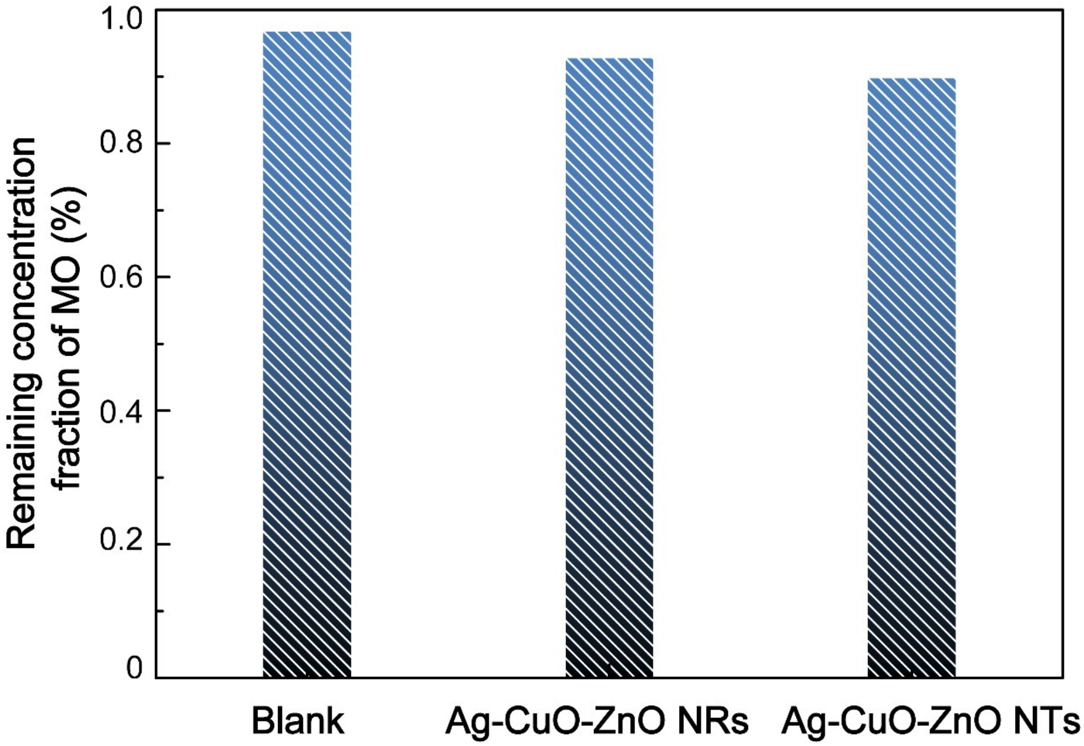

Figure S5. Remaining MO in solution after reaching the adsorption equilibrium in the dark

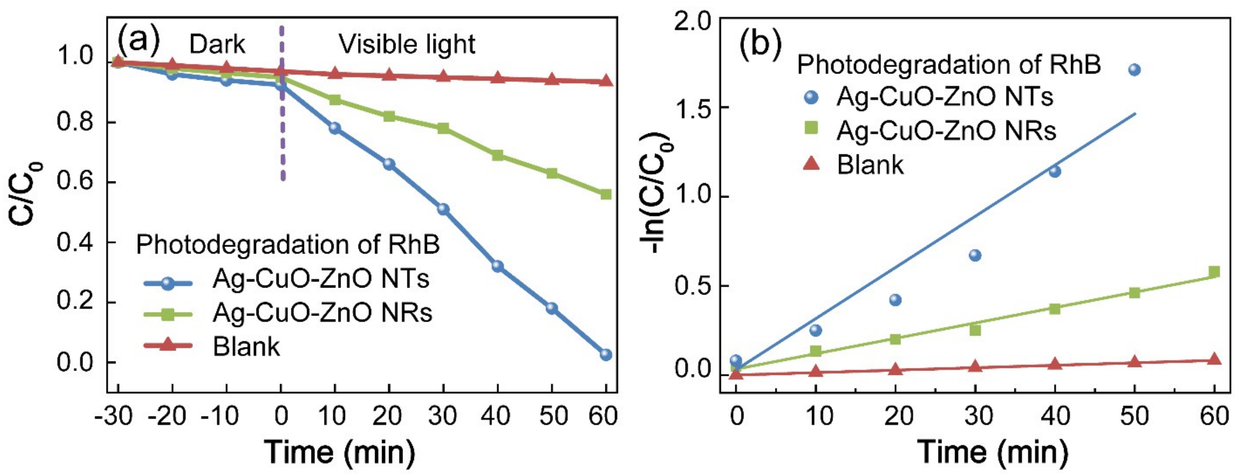

Figure S6. (a) Time-dependent photodegradation efficiency of RhB without photocatalysts and in the presence of the ternary composites based on ZnO NTs and NRs. (b) The corresponding plots of $-\ln(C_t/C_0)$ versus irradiation time.

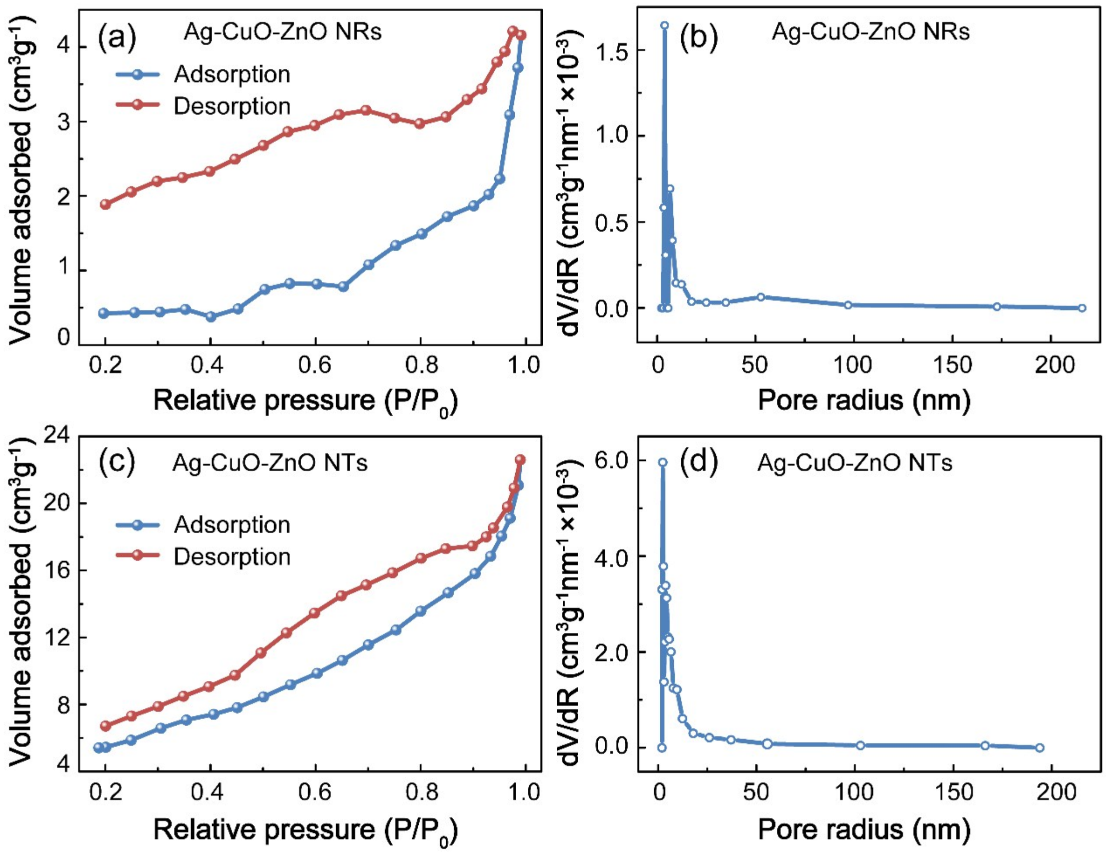

Figure S7. BET of (a), (b) Ag-CuO-ZnO NRs, and (c), (d) Ag-CuO-ZnO NTs.

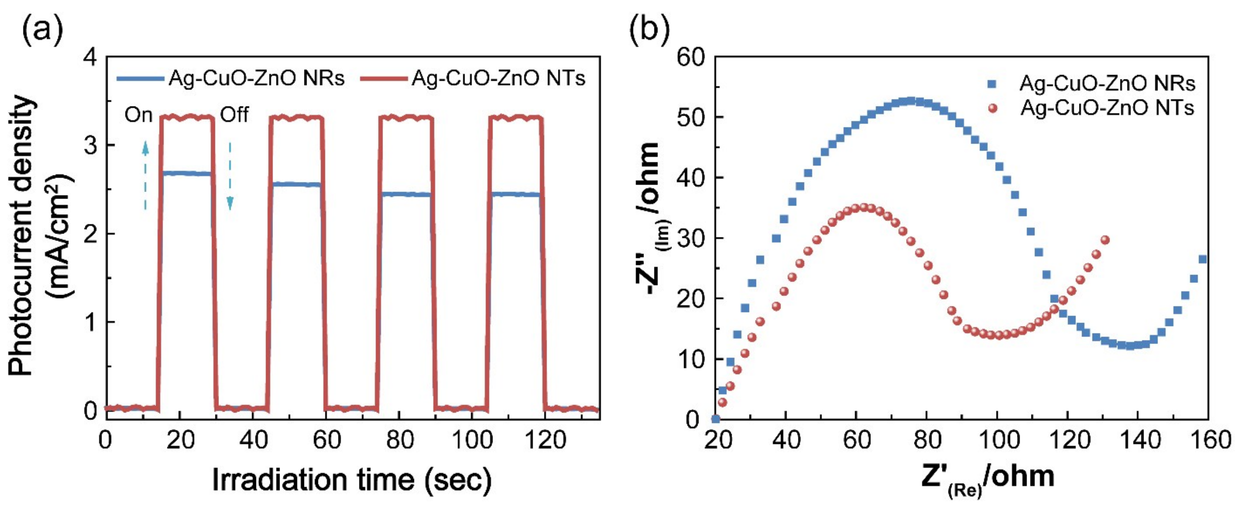

Figure S8. (a) Photocurrent density and (b) electrochemical impedance spectroscopy (EIS) Nyquist plots for the ternary ZnO NRs and ZnO NTs-based composites

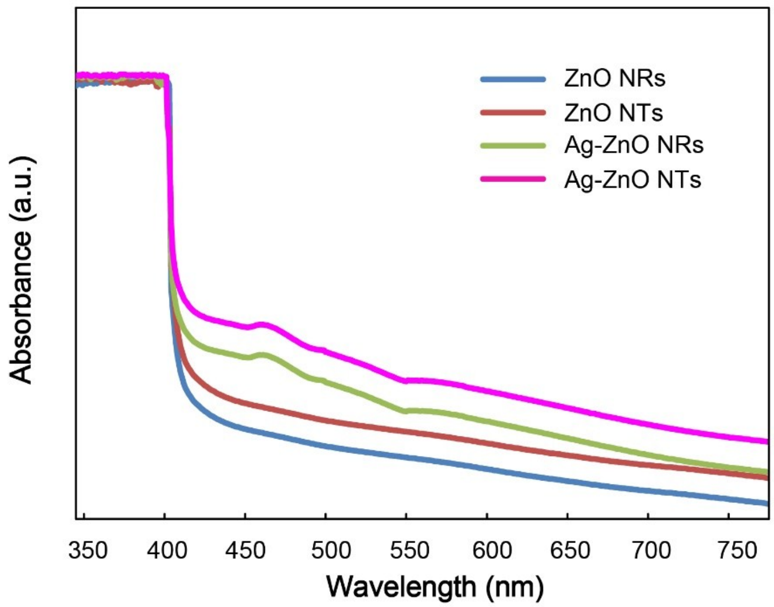

Figure S9. Absorption spectra of the bare ZnO NRs, bare ZnO NTs, Ag-ZnO NRs and Ag-ZnO NTs.

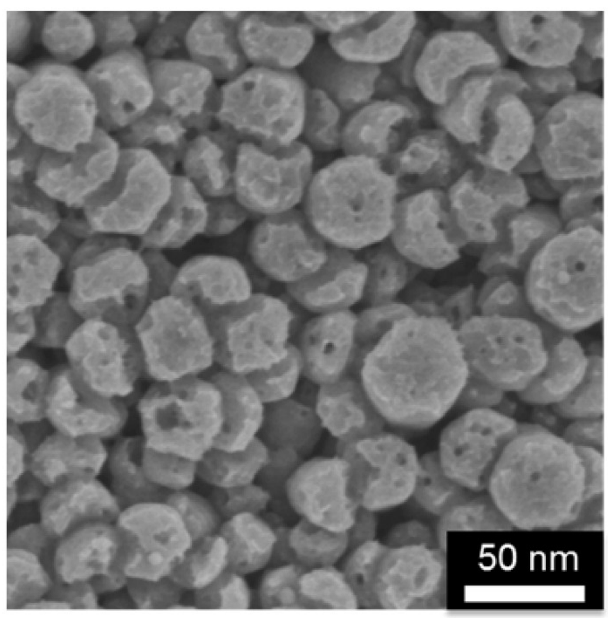

Figure S10. The SEM image of ternary Ag-CuO-ZnO NRs after the 20^{th} photocatalytic cycle degradation.

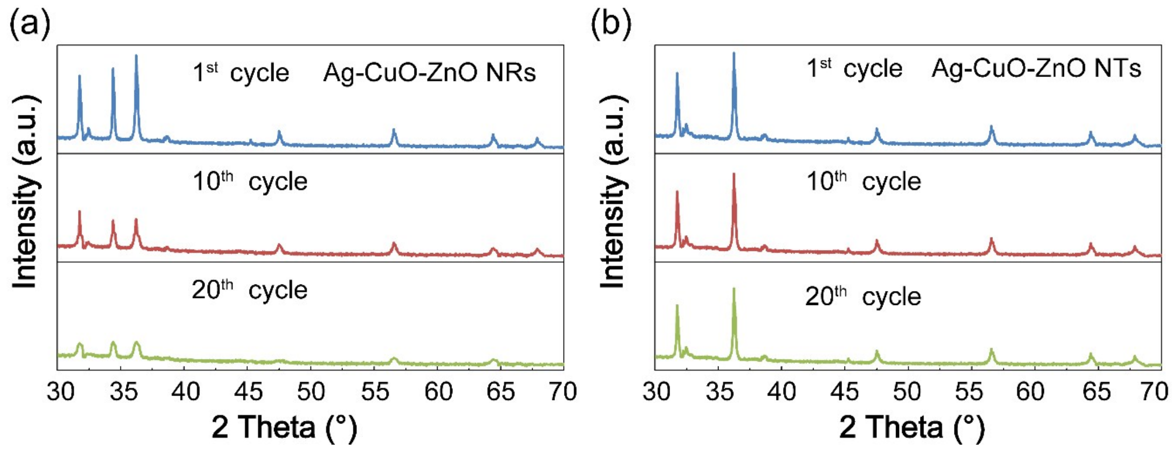

Figure S11. XRD patterns of (a) Ag-CuO-ZnO NRs and (b) Ag-CuO-ZnO NTs after the 1st, 10th and 20th photocatalytic cycle degradation.