Supplementary Information

Novel heterogeneous Fenton catalysts prepared from electrolytic manganese residue for efficient degradation of acetaminophen

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Text S1: Acetaminophen was obtained from Shanghai Yien Chemical Technology Co. Ltd., China. $Mn(NO_3)_2 \cdot 9H_2O$, $Fe(NO_3)_3 \cdot 9H_2O$, $Ce(NO_3)_3 \cdot 6H_2O$, $Zn(NO_3)_2 \cdot 9H_2O$ and $CoCl_2 \cdot 6H_2O$, NaOH, HNO_3, methanol (EtOH), *tert*-butanol (TBA), benzoquinone (BQ), $NaHCO_3$, NaCl, $NaNO_3$, NaH_2PO_4, humic acid (HA) and 5,5-dimethyl-1-pyrroline-N-oxide (DMPO) were purchased from Sinopharm Chemical Reagent Co. Ltd., China.

Text S2: The crystallographic structure of the catalysts was characterized by X-ray diffraction (XRD) in the 2θ range of 10°-80° on a Rigaku Ultima IV diffractometer. The specific surface area, pore volume and average pore width of the catalysts were analyzed by N_2 adsorption-desorption automatic specific surface area analyzer (ASAP 2460, Micromeritics, USA). A field emission scanning electron microscope (FE-SEM, ZEISS Sigma 300, Germany) was used to observe the surface morphology of catalysts. SEM images were obtained by a scanning electron microscope (FE-SEM, ZEISS Sigma 300, Germany) armed with an EDS system. TEM was carried out using a FEI Tecnai F20 (USA) transmission electron microscope. Analysis of surface chemical information for the catalysts was performed by X-ray photoelectron spectrometry (XPS, Thermo Scientific ESCALAB 250Xi, USA). The formation of the radicals in the reaction was determinated by electron paramagnetic resonance spectroscopy (EPR, Bruker EMXPlus, Germany) using 5,5-dimethyl-1-pyrroline N-oxide (DMPO) as the trapping reagent.

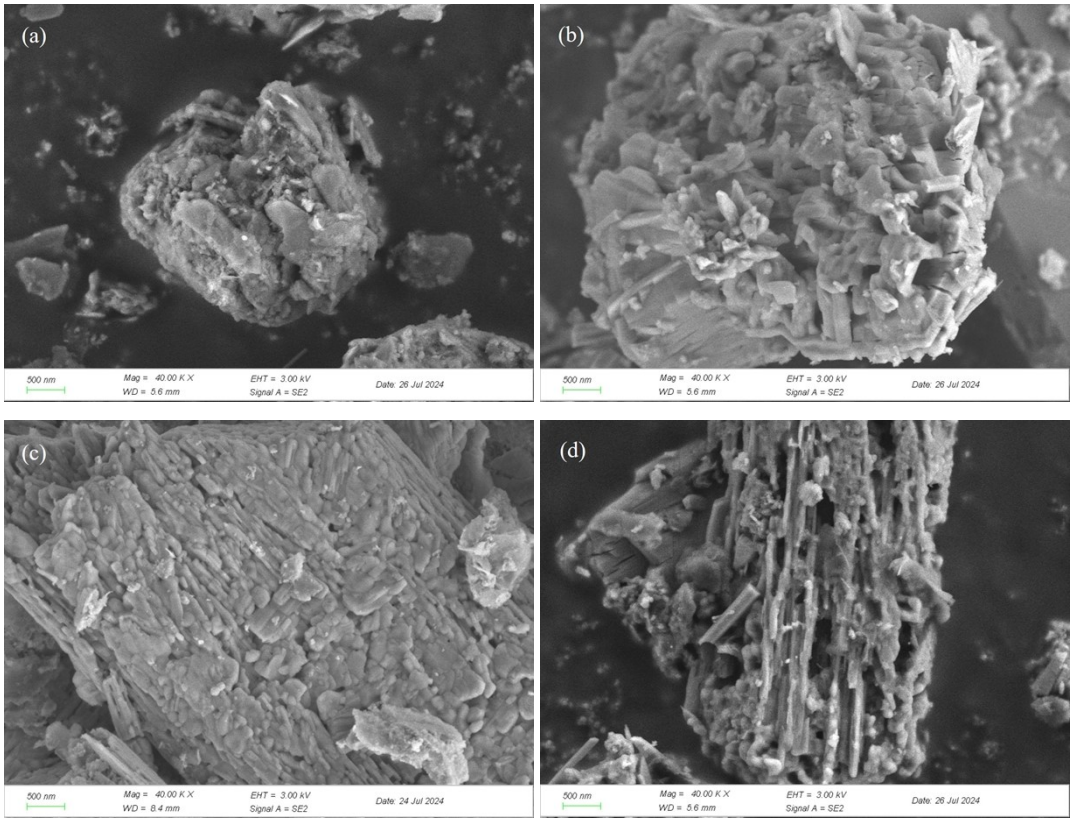

Fig. S1 SEM images of Mn/EMR (a), Fe/EMR (b), Ce/EMR (c) and Zn/EMR (d).

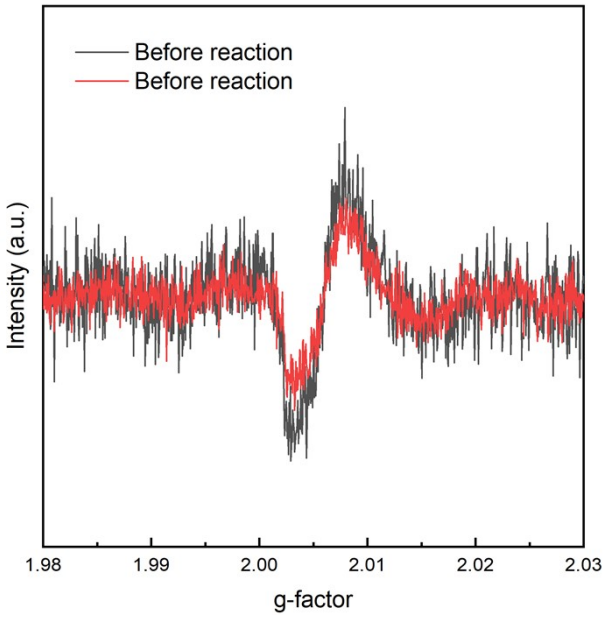

Fig. S2 Solid EPR spectra of Co/EMR before and after reaction.