Supporting Information

Fungi-enabled pore channel regulation and defect engineering of a novel micro-reactor for treating complex effluents.

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Apparatus.

The X-ray diffraction pattern was collected on a X' Pert 3 Powder (XRD, PANalytical B.V., Netherlands). The samples were tested by Field emission scanning electron microscopy (FESEM, Carl Zeiss AG, Germany). The High-resolution TEM (HRTEM) images and SAED patterns were collected at a JEM 2100 transmission electron microscope (JEOL Ltd, Japan). Fourier transform infrared (FT-IR) spectra was processed by a Fourier transform infrared spectrophotometer (Bio-Rad FTS-40). Nitrogen adsorption/desorption isotherms were recorded at an ASAP 2460 (Micromeritics Instruments). Vibrating sample magnetometer (VSM, Versa Lab, Quantum Design, USA), electrospray ionization mass spectrometry (ESI-MS) and X-ray photoelectron spectroscopy (XPS, Perkin Elmer Ltd, USA) were also used to gather the data.

Characterization.

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The FESEM and HRTEM image of RGO/Fe_3O_4/Ag are shown in Fig. S3. Particles with diameter of about 20 nm uniformly dispersed on gauzelike RGO nanosheets. The selected-area electron diffraction pattern (SAED) shows three significant speckles reflected by (111), (200) and (311) crystal planes (Fig. S3c), which can match with the XRD data of Ag and Fe_3O_4, denoting the nanocrystalline characteristics of the selected region. The HRTEM images reveal that the lattice fringes of Fe_3O_4 and Ag nanoparticles are clearly visible across the entire nanocrystals, with the measured value of 0.210 nm and 0.200 nm corresponding to the (400) plane of Fe_3O_4 nanoparticles and (200) plane of Ag nanoparticles respectively.

There are divided three peaks in the C 1s spectrum located at about 284.62 eV, 285.32 eV, and 289.10 eV, which is attributed to C=C, C-N/C-O-C, C-O, the C-N/C-O-C and C-O peaks (Fig. 4b), indicating the presence of numerous functional groups that can improving the interface adsorption of nanomaterials [1,2]. It can be seen in Fe 2p XPS spectrum (Fig. 4c), there are two distinguishable peaks at 711.1 and 724.6 eV assigned to Fe $2p_{3/2}$ and Fe $2p_{1/2}$, which could be deconvoluted into four characteristic peaks at about 710.5, 712.3, 723.9 and 725.7 eV attributed to the Fe (II) $2p_{3/2}$, Fe (III) $2p_{3/2}$, Fe (II) $2p_{1/2}$, and Fe (III) $2p_{1/2}$. As observed from the O1s spectrum (Fig. 4d), peaks at about 531.0 and 533.0 eV in the O 1s spectra belong to the oxygen species of the PC/Fe_3O_4/Ag and the surface adsorbed oxygen, respectively [3]. In high-resolution Ag 3d XPS spectrum (Fig. 4e), there are two strongest characteristic peaks located at 368.3 and 374.4 eV, demonstrating the forming of Ag nanoparticles [4]. Moreover, the high resolution XPS spectrum of N 1s (Fig. 4f) has four characteristic

peaks at 398.5 eV (pyridinic N), 400.0 eV (pyrrolic N), 401.2 eV (graphitic N) and 403.5 eV (oxynitride), respectively.

References

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