Supporting Information

Monitoring Catalytic Degradation of Dye molecules on the Silver-Coated ZnO Nanowire Arrays by Surface-Enhanced Raman Spectroscopy

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Experimental

Catalytic experiments of R6G: Catalytic degradation of R6G molecules was performed as follows. The silica wafer (1.0×1.5 cm) with ZnO nanowire arrays or silver-coated ZnO nanowire arrays was immersed in the aqueous solution of R6G (20 μM, 2.9 mL). After 10 min, a proper amount of the aqueous solution of NaBH₄ (10⁻² M, 0.1 mL) was added into the above solution. The experiments were carried out in a quartz cell with a 10 mm light path for optical absorbance measurement.
**Fig. S1** (a) and (b) are the high-magnification SEM image of the samples shown in Figure 1C and 1D, respectively.
In order to confirm that the SERS is superior to the UV-visible spectroscopy in monitoring the catalytic degradation of dye pollutants, we compared the UV-visible absorption spectrum and the SERS spectrum of R6G with low concentration (2.2×10\(^{-7}\) M). It is found that at low concentration, the UV-visible absorption spectrum is very weak, while the signals characteristic of R6G molecules in the SERS spectra are clear and unambiguous (as shown in Fig. S3).

**Fig. S2** UV-visible absorption spectra of R6G during different reaction-time.
Fig. S3 UV-visible absorption spectrum and SERS spectra of R6G collected from the silver-coated ZnO nanowire arrays. [R6G] = 2.2×10⁻⁷ M.
Fig. S4 Spectral variation of R6G in the reaction between R6G and NaBH₄ (A) in the absence of the as-prepared sample, and in the presence of (B) the silver-coated ZnO nanowire arrays. The inset figures in (B) is the corresponding kinetic degradation for MB. (C) Time-dependent SERS spectra of MB adsorbed on the silver-coated ZnO nanowire arrays during the degradation process: (a) 0 min, (b) 5 min, (c) 10 min and (d) 15 min; (D) the corresponding linear relationship spectra of -ln(I/I₀) versus reaction-time acquired from SERS band 1622 cm⁻¹, respectively. Laser wavelength 514.5 nm. [NaBH₄] =10⁻² mol/L, [MB] = 2 × 10⁻⁵ mol/L.
The same catalytic study of MB was performed (Fig. S4). In the absence of the as-prepared sample, the MB can be degraded about 17.3% in 20 min. But about 35.7% of MB was degraded in 20 min in the presence of silver-coated ZnO nanowire arrays. The rate constant is about 0.021 min$^{-1}$ in the presence of silver-coated ZnO nanowire arrays. The corresponding SERS spectra were shown in Fig. S4C. The rate constants calculated from the slopes of the straight lines were 0.033 min$^{-1}$ for SERS bands at 1622 cm$^{-1}$. 