Supporting Information

Monodispersed Ag nanoparticles loaded on the PVP-assisted synthetic Bi$_2$O$_2$CO$_3$ microspheres with enhanced photocatalytic and supercapacitive Performances

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Fig. S1 XRD pattern and SEM image of the Bi$_2$O$_2$CO$_3$-3 by using Na$_2$CO$_3$ as the precursor.
**Fig. S2** Nitrogen adsorption–desorption isotherm and the corresponding pore size distribution (inset) of Bi$_2$O$_2$CO$_3$-1, Bi$_2$O$_2$CO$_3$-2 and Bi$_2$O$_2$CO$_3$-3, respectively.

The Brunauer–Emmett–Teller (BET) surface areas of Bi$_2$O$_2$CO$_3$-1, Bi$_2$O$_2$CO$_3$-2 and Bi$_2$O$_2$CO$_3$-3 calculated from N$_2$ isotherms are 45.8, 29.3 and 8.9 m$^2$ g$^{-1}$, respectively.

**Fig. S3** XRD patterns of samples using different amounts of PVP: 0.2 g (a), 0.4 g (b), and 0.6 g (c), respectively.
**Fig. S4** SEM images of samples using different amounts of PVP: 0.2 g (a), 0.4 g (b), and 0.6 g (c), respectively.

**Fig. S5** XRD pattern of the product obtained in the absence of PVP and only using 0.9 g of HMT.
**Fig. S6** IR spectra of the PVP (a), PVP/Bi(NO$_3$)$_3$ (b), Bi$_2$O$_2$CO$_3$–3 (c), Bi$_2$O$_2$CO$_3$–2 (d) Bi$_2$O$_2$CO$_3$–1 (e), respectively.
**Fig. S7** SEM images of Bi$_2$O$_2$CO$_3$−1 obtained through different times: 30 min (a,b), and 4 h (c, d), respectively.

**Fig. S8** XRD patterns of the products obtained by using 0.04 g (a), 0.06 g (b) and 0.2 g (c) of KCl, respectively.
**Fig. S9** EDS spectra of the products obtained by using 0.04 g (a), 0.06 g (b) and 0.2 g (c) of KCl, respectively.

**Fig. S10** XRD pattern of Ag(0.3%)/Bi$_2$O$_2$CO$_3$−1 and Ag(0.9%)/Bi$_2$O$_2$CO$_3$−1, respectively.
**Fig. S11** XPS spectrum of the obtained Ag(0.6%)/Bi$_2$O$_2$CO$_3$–1: survey XPS spectrum (a), high-resolution Bi 4f (b), C 1s (c), and O 1s (d) spectrum.

**Fig. S12** Time-dependent absorption spectra of MO photocatalytic degradation with Ag(0.3%)/Bi$_2$O$_2$CO$_3$–1 and Ag(0.9%)/Bi$_2$O$_2$CO$_3$–1, respectively.
Fig. S13 The CV curves of Ni foam without loading of Bi$_2$O$_2$CO$_3$ at 50 mV s$^{-1}$.

Fig. S14 Nyquist plots of the EIS for the Bi$_2$O$_2$CO$_3$–1, Ag(0.6%)/Bi$_2$O$_2$CO$_3$–1.
Fig. S15 Specific capacitance as a function of current densities for Ag(1%)/Bi$_2$O$_3$CO$_3$−1.