Supporting Information

Ag@SrTiO$_3$ nanocomposite for super photocatalytic degradation of organic dye and catalytic reduction of 4-nitrophenol

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Fig. S1 The FESEM image (a) and XRD pattern (b) of the SrTiO$_3$ precursor.
For the SrTiO$_3$ precursor, the broad absorption peak at 3430 cm$^{-1}$ and the band at 1639 cm$^{-1}$ are individually the stretching and bending vibrational mode of O — H bond, confirming the product absorbed a small amount of water molecules or bonded some hydroxyl groups. The absorption peaks observed at 2860 and 2835 cm$^{-1}$ were associated with the stretching vibration of C — H bond. The bands at 1456 and 1385 cm$^{-1}$ are attributed to the bending vibration of C — H bond. The bands at 1126, 1090 and 1055 cm$^{-1}$ can be attributed to the stretching vibration of C — O or C — N bond. The bands at 858 and 596 cm$^{-1}$ are the stretching vibration of Sr — O and Ti — O bond, respectively. Therefore, the FTIR spectrum revealed organic groups bonded on the SrTiO$_3$ precursor, suggesting it was an organic-inorganic hybrid. After calcination at 550°C for 6 h, the broad absorption peaks at 3430 and 1639 cm$^{-1}$ attributed to the stretching and bending vibration of O — H bond still presented, confirming some hydroxyl groups bonded on the product. The absorption peak at 1385 cm$^{-1}$ was associated with the bending vibration of C — H bond. The band at 1090 cm$^{-1}$ can be attributed to the stretching vibration of C — N bond. The band at 588 cm$^{-1}$ is the stretching vibration of Ti — O bond. Thus, it can be inferred that 1, 6-hexanediamine molecules were bonded on the surface of pristine SrTiO$_3$ even after calcination.
Fig. S3 EDX spectra of 2% (a) and 10% Ag@SrTiO$_3$ (b).
Fig. S4 Survey XPS spectra of (a) 2% and (b) 10% Ag@SrTiO₃.
Fig. S5 Nitrogen adsorption–desorption isotherm of the catalysts. The inset is its BJH pore-size distribution curve. (a) SrTiO$_3$. (b) 2% Ag@SrTiO$_3$. (c) 5% Ag@SrTiO$_3$. (d) 10% Ag@SrTiO$_3$. 
Fig. S6 Photocatalytic degradation curves of phenol aqueous solution in the presence of the pristine SrTiO$_3$ and Ag@SrTiO$_3$ nanocomposites as well as the blank.
Fig. S7 Time-dependent UV-vis spectrum for the catalytic reduction of 4-NP by NaBH$_4$ in the presence of the pristine SrTiO$_3$. 