

Supplementary data

Core-shell structured nanocomposites Ag@CeO₂ as catalyst for hydrogenation of 4-nitrophenol and 2-nitroaniline

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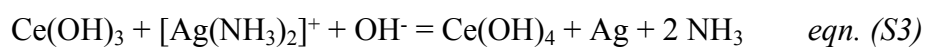
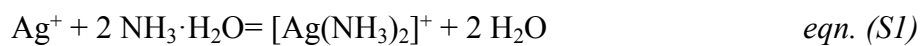
1.1. Synthesis of commercial CeO₂ supported Ag NPs

0.1 g of commercial CeO₂ and 10 mL of 0.005 mM AgNO₃ aqueous solution were mixed together. After stirring at room temperature for 2 h, 10 mg of NaBH₄ was added into this aqueous solution. The product was purified by centrifugation and dried at 313 K in vacuum overnight.

1.2. Synthesis of free Ag NPs

With constant vigorous stirring, a certain amount NaBH₄ was added to AgNO₃ aqueous solution (10 mL, 0.15 M). The obtained product was further washed with anhydrous ethanol and water three times. It was obtained by drying in vacuum oven at 313 K overnight.

Under N₂ atmosphere, redox reaction occurs between [Ag(NH₃)₂]OH and Ce(NO₃)₃ in an alkaline condition.



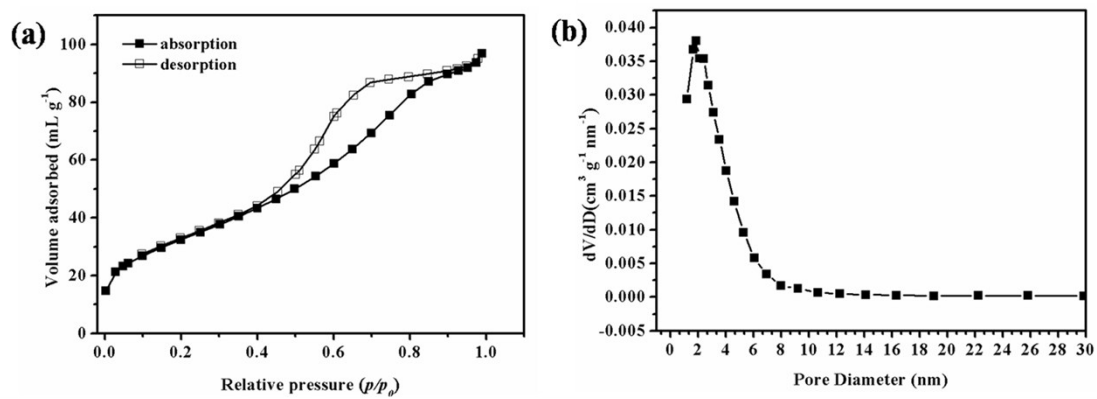


Fig. S1. Nitrogen adsorption-desorption isotherms (a) and the pore size distribution (b) of the Ag@CeO₂ NCs.

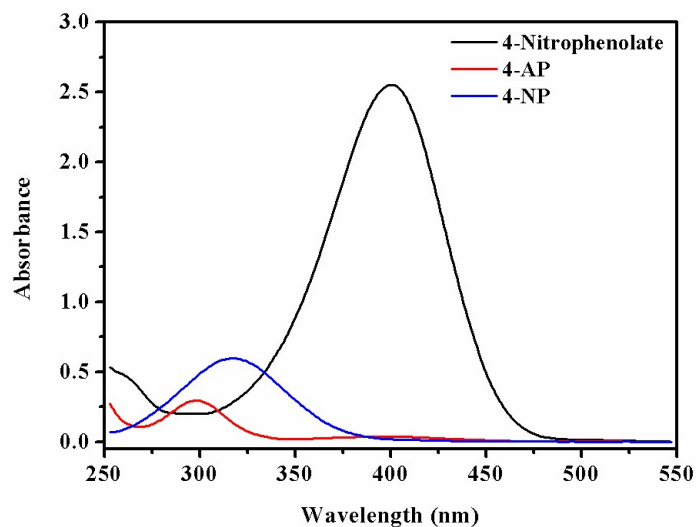


Fig. S2. UV-vis absorption spectra of 4-Nitrophenolate ion (black line), 4-AP (red line), and 4-NP (blue line).

Initially, the 4-NP solution, which have a light yellow color, rapidly turned bright yellow upon the addition of NaBH_4 solution because of the formation of 4-nitrophenolate ions in the alkaline conditions.²⁵⁻²⁸ The corresponding absorption peak shifted from 317 nm (assigned to 4-NP) to 400 nm (assigned to 4-nitrophenolate ion), and the absorption peak at 298 nm is 4-AP which is colourless after the complete reduction.

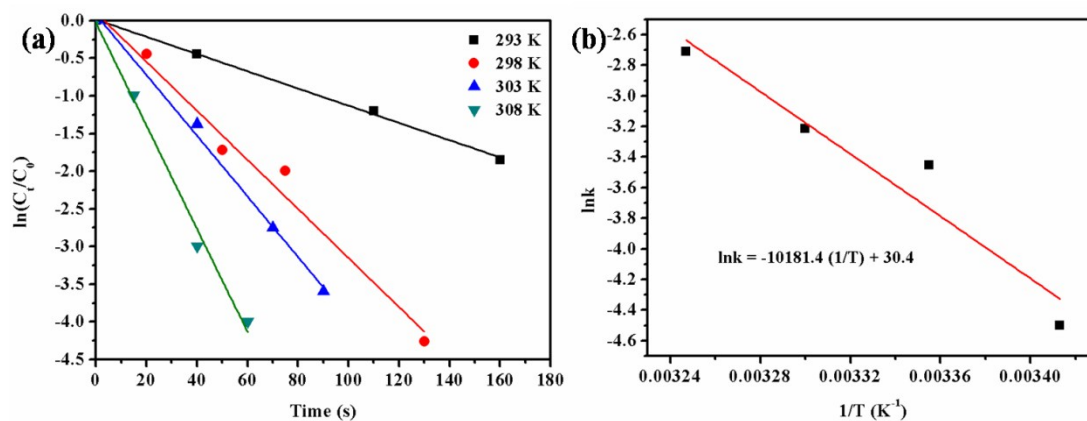


Fig. S3. Plots of $\ln(C_t/C_0)$ versus time for the catalytic reduction of 4-NP with NaBH_4 by $\text{Ag}@CeO_2$ NCs at different temperatures (a) and the corresponding Arrhenius plot (b) ($\text{Ag}/4\text{-NP} = 0.20$, $\text{NaBH}_4/4\text{-NP} = 154$).

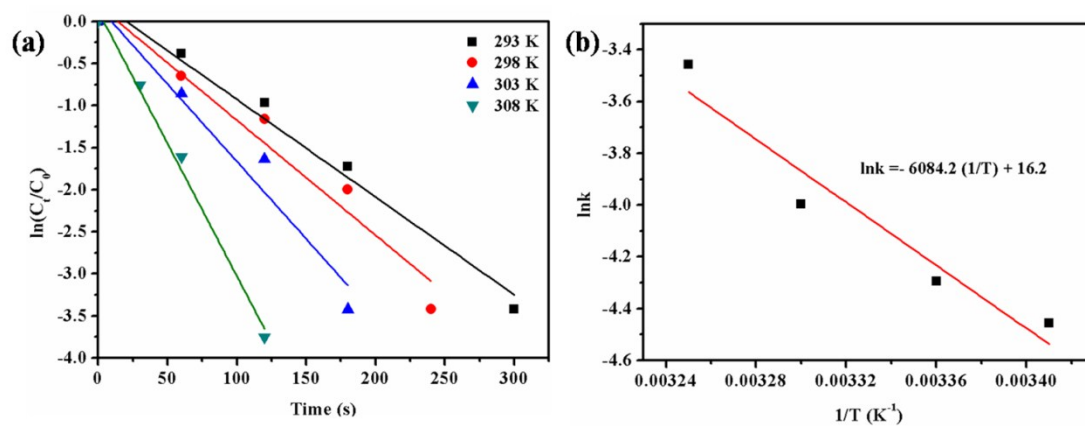


Fig. S4. Plots of $\ln(C_t/C_0)$ versus time for the catalytic reduction of 2-NA with NaBH_4 by Ag@CeO_2 NCs at different temperatures (a) and the corresponding Arrhenius plot (b) ($\text{Ag}/2\text{-NA} = 0.14$, $\text{NaBH}_4/2\text{-NA} = 316$).

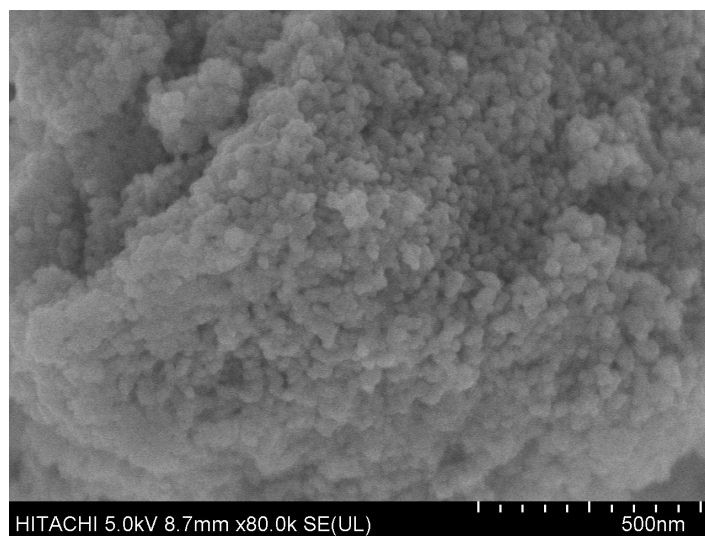


Fig. S5. SEM image of the Ag@CeO₂ NCs after tenth runs for the catalytic reduction of 4-NP.