Pt-Ag Cubic Nanocages with Wall Thickness Less Than 2 nm and Their Enhanced Catalytic Activity toward Oxygen Reduction

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Figure S1. UV-vis spectra recorded from aqueous solutions of H₂PtCl₆ in the presence of (A) PVP, (B) NaOH, and (C) PVP plus NaOH. As discussed in ref. 26, the peak shift from 261 nm to 258 nm is due to the complexing between Pt(IV) and the nitrogen atoms in PVP. The addition of NaOH did not cause any change to the UV-vis peak up to 45 min, indicating a slow ligand exchange process with OH⁻. In the presence of both PVP and NaOH, the Pt(IV) can be slowly reduced by the hydroxyl end groups on PVP.
Figure S2. TEM image of Ag nanocubes with an edge length of 38.6±1.3 nm.
Figure S3. XPS of Ag@Pt nanocubes prepared by reacting Ag nanocubes with 0.02 mL and 0.1 mL of 0.2 mM H₂PtCl₆ in the presence of H₂Asc, PVP and NaOH at pH=11.9, respectively.
Figure S4. TEM image of the sample prepared by injecting 0.4 mL of aqueous H$_2$PtCl$_6$ in the presence of H$_2$Asc and PVP, but in the absence of NaOH.
Figure S5. TEM image of Pt-Ag nanocages prepared by reacting Ag nanocubes with 0.8 mL of aqueous H$_2$PtCl$_6$ in the presence of H$_2$Asc, PVP, and NaOH at pH=11.9, followed by etching with an aqueous solution containing Fe(NO$_3$)$_3$ and HNO$_3$. 

Figure S6. TEM images of Ag@Pt core-shell nanocubes (A) before and (B) after etching with Fe(NO$_3$)$_3$/HNO$_3$. The sample was prepared by reacting Ag nanocubes with 0.4 mL of aqueous K$_2$PtCl$_4$ (0.2 mM) in the presence of H$_2$Asc, PVP, and NaOH at pH=11.9.
Figure S7. TEM images of Ag@Pt core-shell nanocubes after treatment with (A) 3% aqueous H$_2$O$_2$ and (B) H$_2$Asc/PVP and then 3% aqueous H$_2$O$_2$. The samples were prepared by reacting Ag nanocubes with 0.4 mL of aqueous H$_2$PtCl$_6$ (0.2 mM) in the presence of H$_2$Asc, PVP, and NaOH at pH=11.9.
Figure S8. TEM images of Pt-Ag nanocages supported on carbon (A) before and (B) after the accelerated durability test.