Supporting Information

Triangular Ag-Pd alloy Nanoprisms: Rational Synthesis with High-Efficiency for Electrocatalytic Oxygen Reduction

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Detailed experimental methods

Chemicals: Silver nitrate (99%), tetrachloroauric acid (99.5%), sodium borohydride (99%), trisodium citrate dihydrate (99%), hydroxylamine hydrochloride (99%), Bis(p-sulfonatophenyl) phenylphosphine dihydrate dipotassium (BSPP), ascorbic acid (AA, >99%), and palladium (II) chloride (99%) were purchased from Sigma-Aldrich and used as received. Palladium (10% on carbon) was supplied by Alfa Aesar. Ultrapure water (Milli-Q System Millipore, USA) was used for all experiments.

Synthesis of silver nanoparticles: In a typical synthesis, a 250-mL three-neck flask was placed in an ice bath, and ultrapure water (190 mL) was introduced into the flask and bubbled with nitrogen gas for one hour under stirring. Then 1 mL solution of $AgNO_3$ (20 mM) and 2 mL solution of trisodium citrate (30 mM) were added into the flask. Subsequently 2 mL freshly prepared solution of $NaBH_4$ (60 mM) was rapidly injected into the solution. Over the next 20 min, 5 drops of the $NaBH_4$ solution (60 mM) were added into the solution at 2-min interval. Then 0.5 mL solution of $NaBH_4$ (60 mM) and 0.5 mL solution of BSPP (5 mM) were

simultaneously added dropwise into the solution over the next 10 min. The resulting solution was kept stirring for 3 hours in the ice bath and then aged overnight at ~4 ^{o}C in the dark.

Preparation of silver nanoprisms: The as-prepared solution of silver nanoparticles (20 mL) was irradiated by a 150-W halogen illuminator (MI-150, Fiber-Lite, USA) coupled with an optical bandpass filter centered at 500 ± 20 nm for 1~2 hours and then 600 ± 20 nm for 2~3 hours. The resulting solution exhibited a major extinction bands at ~700 nm, indicating the formation of silver nanoprisms.

Characterization: The morphology and structure of the products were investigated through transmission electron microscopy (TEM, JEOL JEM-2010F) and high resolution TEM (HRTEM, JEOL JEM-2100F) at an accelerating voltage of 200 kV. The composition of the products was analyzed by energy dispersive X-ray (EDX) spectroscopy, which is built on the HRTEM (JEM-2100F), with elemental mapping and line profiles. The phase purity and crystallinity of the product was identified by X-ray diffraction (XRD) on a Bruker D8 Advance equipped with a Cu-Kα radiation (λ = 1.5418 Å) at a scanning rate of 0.02^{o} s^{-1} in a 2θ range of 30–80^{o}.

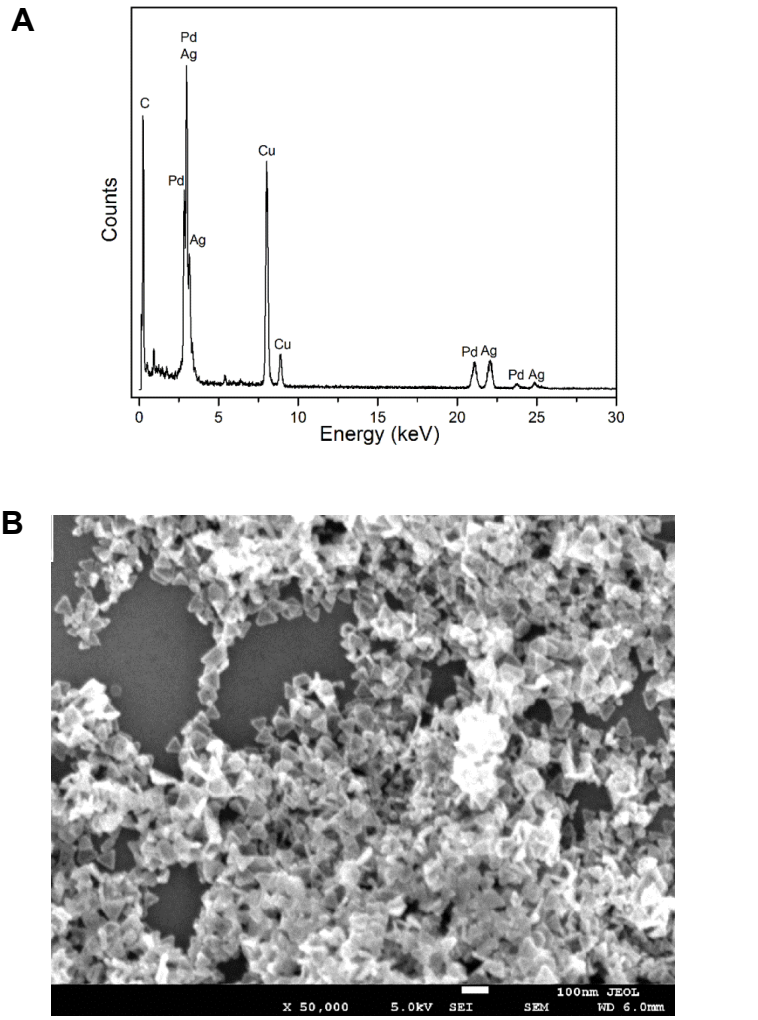

Figure S1. (A) EDS analysis and the elemental composition of the triangular Ag-Pd alloy nanoprisms. The C and Cu signals were from the copper grid. (B) SEM image of the triangular Ag-Pd alloy nanoprisms.

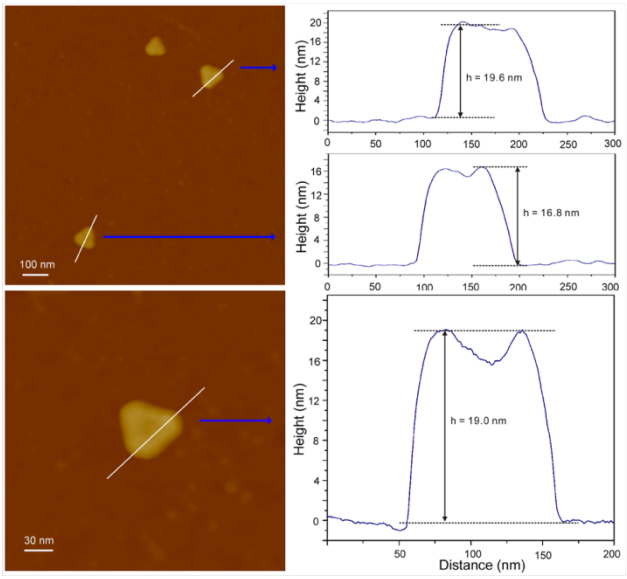

Figure S2. AFM images and line-scan height profiles of the as-obtained Ag-Pd alloy nanoprisms, demonstrating the average thickness of ~18 nm.

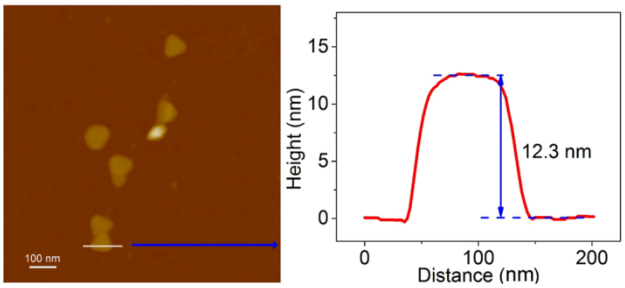

Figure S3. AFM image and line-scan height profile of the Ag nanoprism templates, demonstrating the average thickness of ~12 nm.

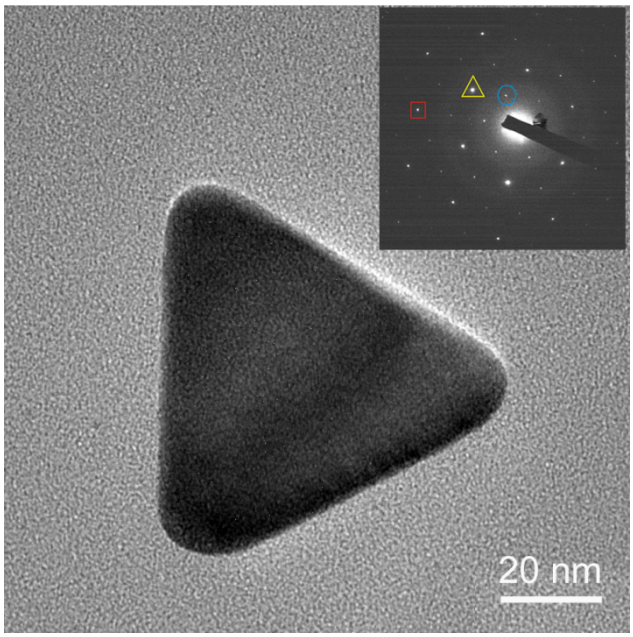

Figure S4. TEM image of an individual Ag nanopprism taken from the flat top facet. The inset shows the corresponding SAED pattern taken from this particle. The spots (triangle, square, and circle) could be indexed to the allowed {220} reflection, the allowed {422} reflection, and the formally forbidden (1/3){422} reflection, respectively.

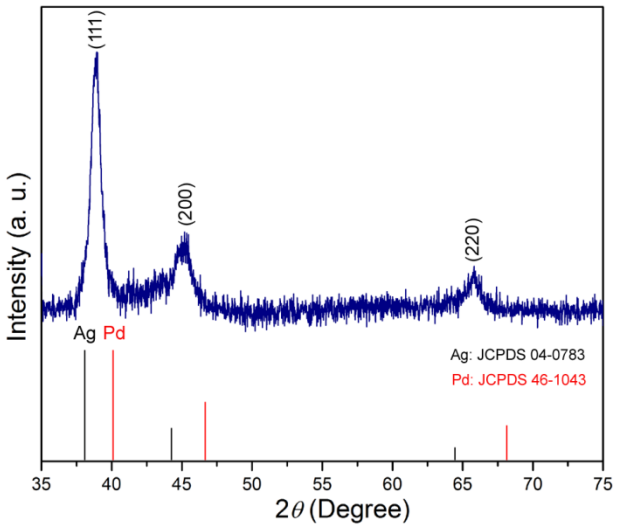

Figure S5. XRD pattern of the as-synthesized Ag-Pd alloy nanoprisms, confirming the only Ag-Pd alloy phase in the final product. The standard patterns of Ag and Pd are also presented at the bottom for comparison.