SUPPORTING INFORMATION

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One-dimensional Rhodium-nickel Alloy Assemblies with Nano-dendrite Subunits for Alkaline Methanol Oxidation

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n EXPERIMENTAL SECTION

Physical Characterization. Powder X-ray diffraction (XRD) measurements were performed on a DX-2700 X-ray diffractometer with CuKα radiation source at room temperature. Inductively coupled plasma atomic emission spectroscopy (ICP-MS) measurement was performed on a Prodigy 7 instrument. Scanning electron microscopy (SEM) measurements and energy-dispersive X-ray (EDX) measurements were carried out on a SU-8020 instrument. Transmission electron microscopy (TEM) images, selected area electron diffraction (SAED) pattern, high-angle annular dark-field scanning TEM (HAADF-STEM) images, and HAADF-STEM-EDX-maps images were captured on TECNAI G2 F20 microscopy equipped with EDX detector. X-ray photoelectron spectroscopy (XPS) spectra were achieved on an AXIS ULTRA spectrometer.

Electrochemical Measurements. In a three-electrode system, a saturated calomel electrode (SCE) was used as reference electrode, a carbon rod as the auxiliary electrode, and an electrocatalyst-modified glassy carbon as the working electrode, which were carried out on a CHI-660 electrochemical analyser at 30 ℃. In our experiment, the saturated calomel electrode (SCE) is protected by Luggin capillary with KCl solution, which can effectively prevent the permeation of OH^- ion and consequently avoid the damage of SCE electrode. All applied potentials in this work were adapted to the reversible hydrogen electrode (RHE) according to the equation ERHE = ESCE + 0.242 V + 0.0591 pH. The electrochemically active surface areas (ECSA) of electrocatalysts were determined by a double-layered capacitance method, which were obtained by cyclic voltammetry (CV) data. The working electrode was obtained by mixing 2 mg of catalyst, 0.2 mL of isopropyl alcohol and 0.8 mL of water. The 4 μL of the catalyst ink was loaded onto the glassy carbon electrode surface and dried at room temperature. Then, 4 μL of Nafion solution (0.05 wt%) was coated on the working electrode surface and dried at room temperature. The catalyst loading mass density on a working electrode was 1.14 $mg \cdot cm^{-2}$. And a typical CO stripping measurement was done as follows: (1) the catalyst surface was clean by conducting 2 cycles of cyclic voltammetry between 0 and 1.0 in N_2-saturated 1 M KOH solution at 50 $mV \cdot s^{-1}$ on the electrode. (2) CO was adsorbed by chronoamperometric curves for 600 s in CO-saturated 1 M KOH solution at 0 V.

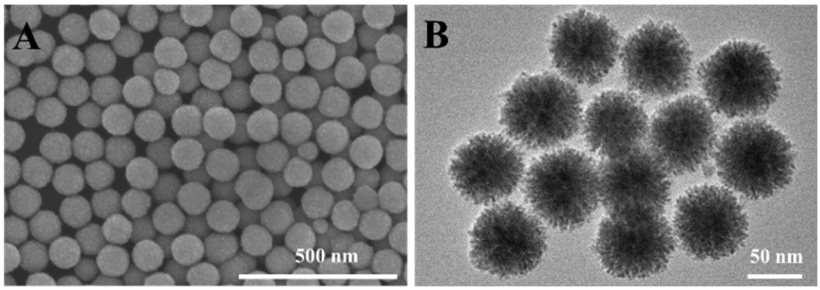

Figure S1. (A) SEM and (B) TEM images of Rh-NDs.

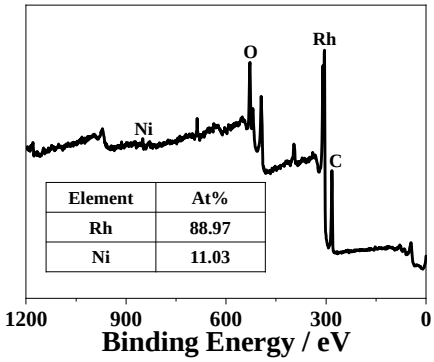

Figure S2. XPS survey spectrum of Rh_1Ni_1-NDs-As.

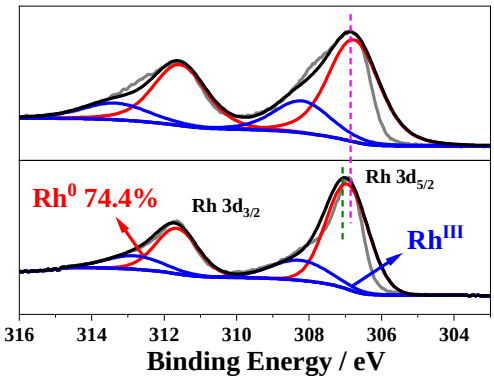

Figure S3. Rh 3*d* XPS spectra of Rh_1Ni_1-NDs-As and Rh-NDs.

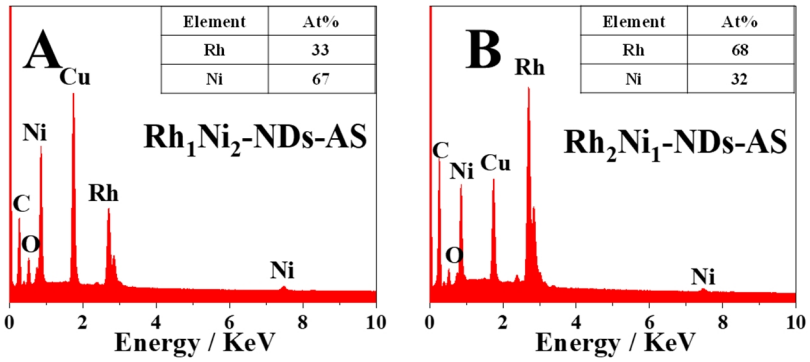

Figure S4. EDX spectra of (A) Rh_1Ni_2-NDs-As and (B) Rh_2Ni_1-NDs.

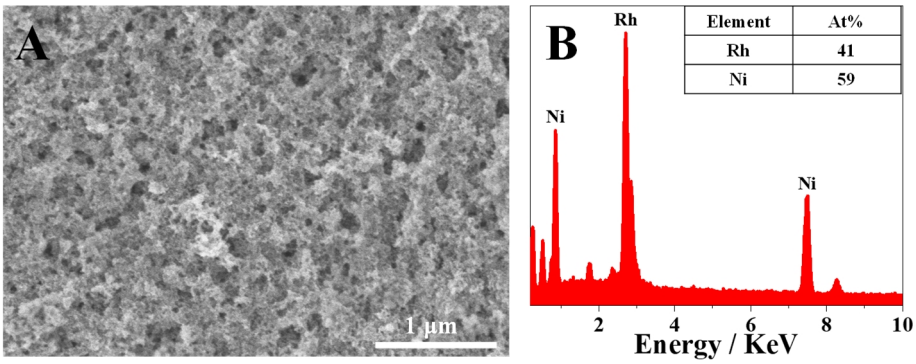

Figure S5. (A) SEM image and (B) EDX spectrum of RhNi-NPs.

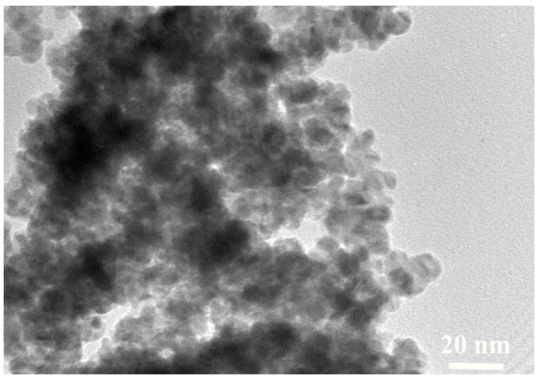

Figure S6. TEM image of Rh-NPs-C catalyst.

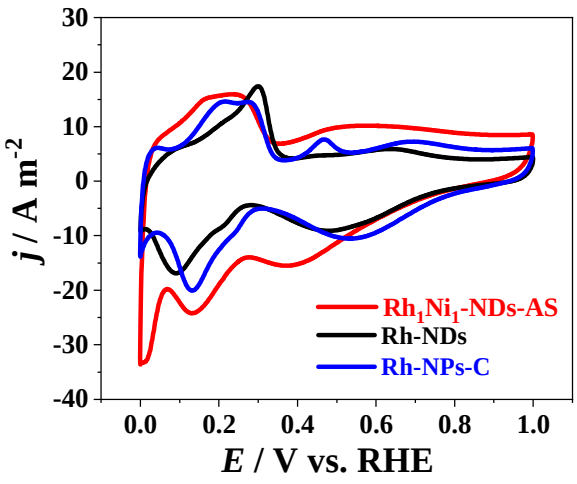

Figure S7. (A) CV curves of Rh_1Ni_1-NDs-As, Rh-NDs and Rh-NPs-C in 1 M KOH solution at 50 $mV \cdot s^{-1}$.

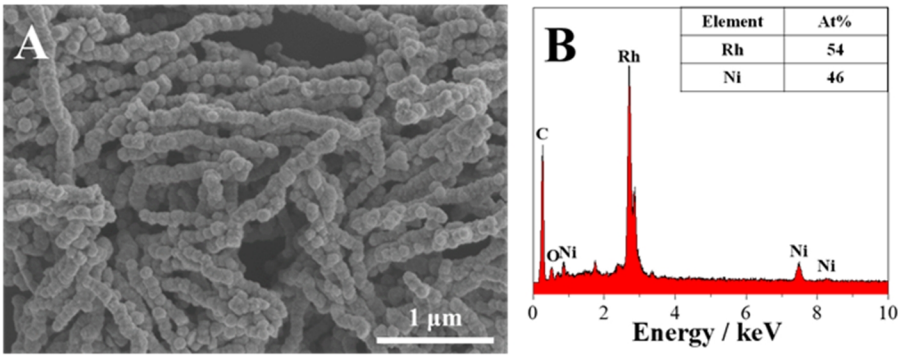

Figure S8. (A) SEM image and (B) EDX spectrum of Rh_1Ni_1-NDs-As after chronoamperometry test.