

Electronic Supplementary Information

Synthesis of Low-Cost Multi-element Pt Base Alloy Nanoparticles as Catalysts for Oxygen Reduction Reaction

Jhon L. Cuya Huaman, Kaneyuki Taniguchi, Daichi Iwata, Kozo Shinoda, Shun Yokoyama, Hiroshi Miyamura and Jeyadevan Balachandran

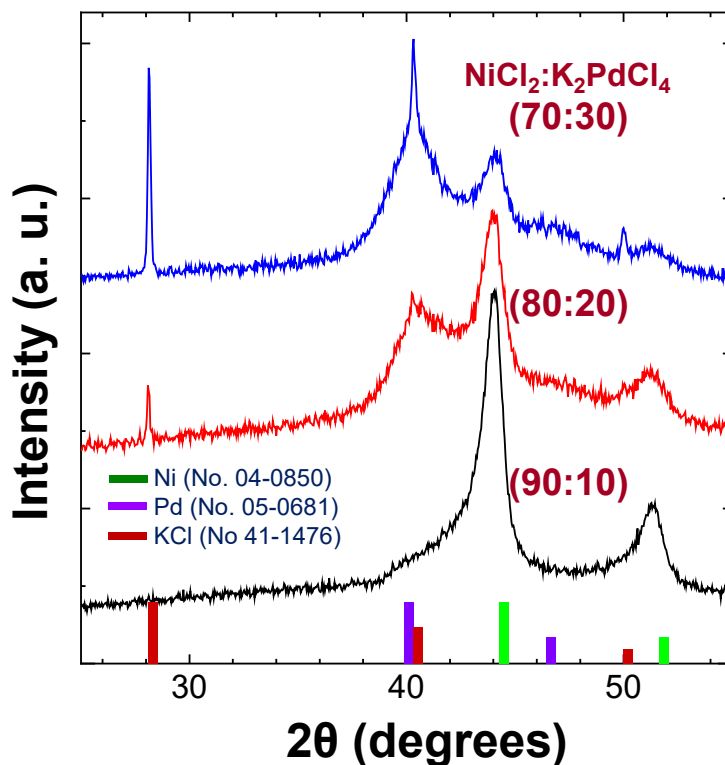


Fig. S1 XRD patterns of Ni-Pd NP samples synthesized using NiCl_2 and K_2PdCl_4 metal precursors at different molar ratios.

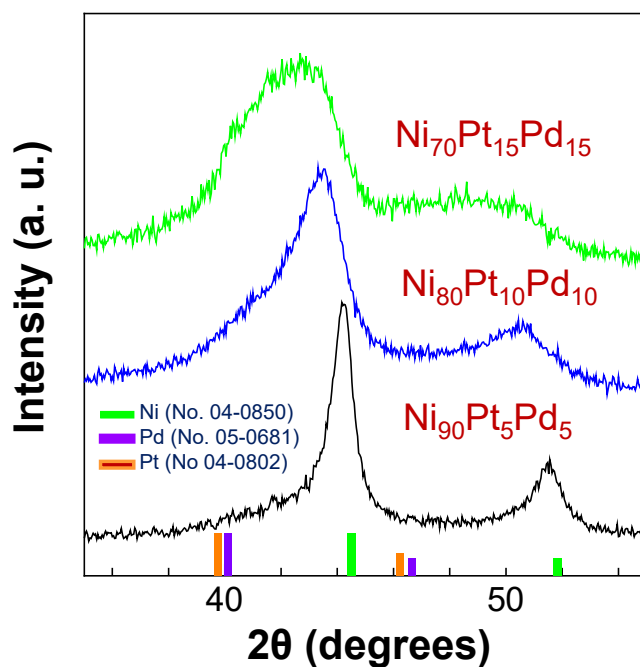


Fig. S2 XRD patterns of Ni₇₀Pt₁₅Pd₁₅, Ni₈₀Pt₁₀Pd₁₀, and Ni₉₀Pt₅Pd₅ NPs samples synthesized in 1-heptanol using Ni(OAc)₂, H₂PtCl₆ and K₂PdCl₄ as metal precursors at different molar ratios.

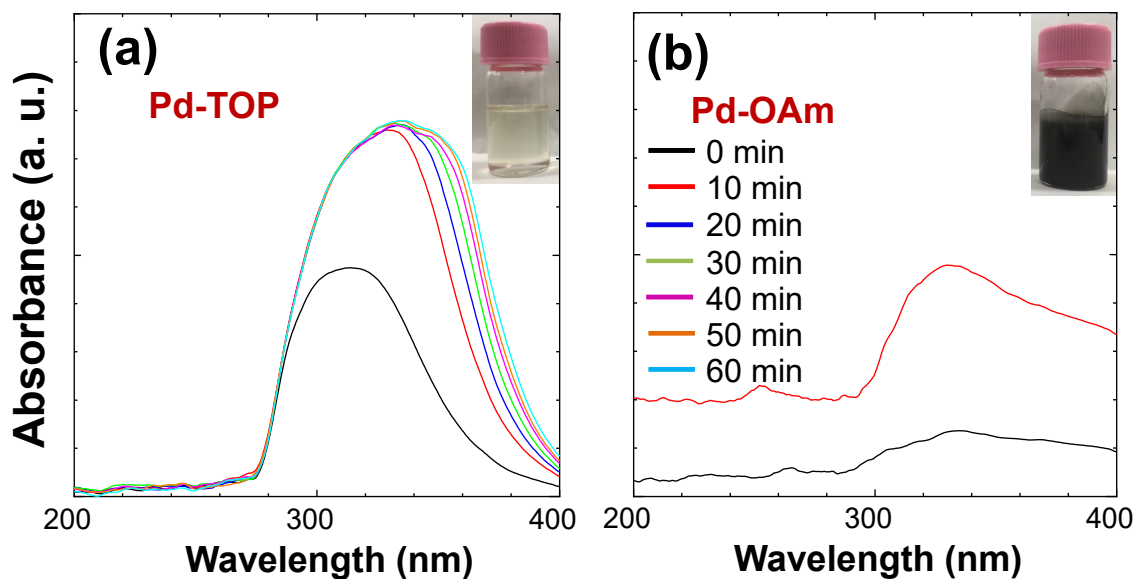
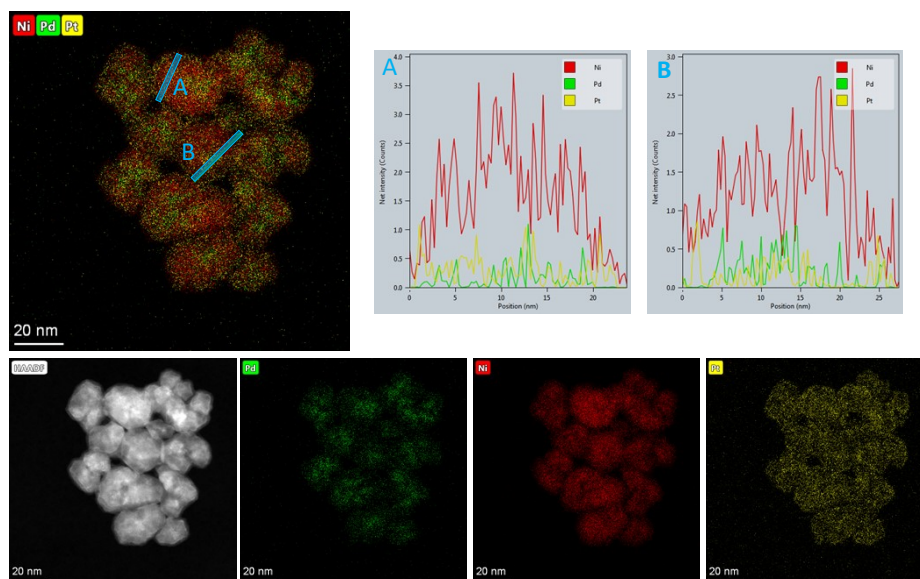


Fig. S3 In situ UV-vis spectroscopic measurements during synthesis of Pd NPs in 1-heptanol at 173 °C using (a) TOP and (b) OAm as surfactants.

(a) Pt-rich shell NiPtPd NPs



(b) Pd-rich shell NiPtPd NPs

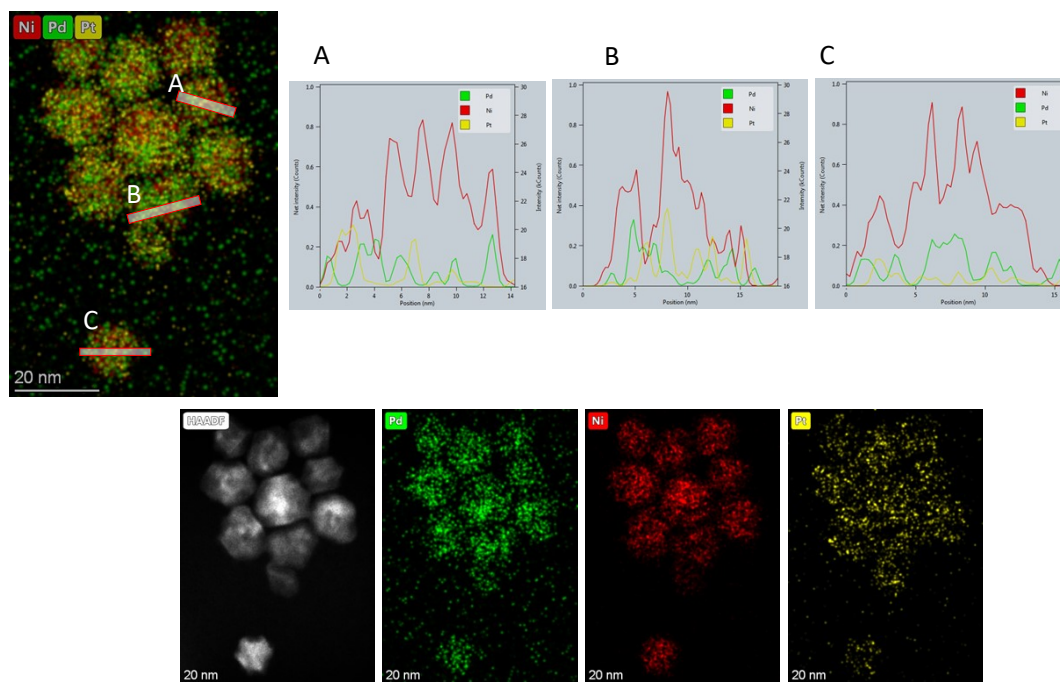
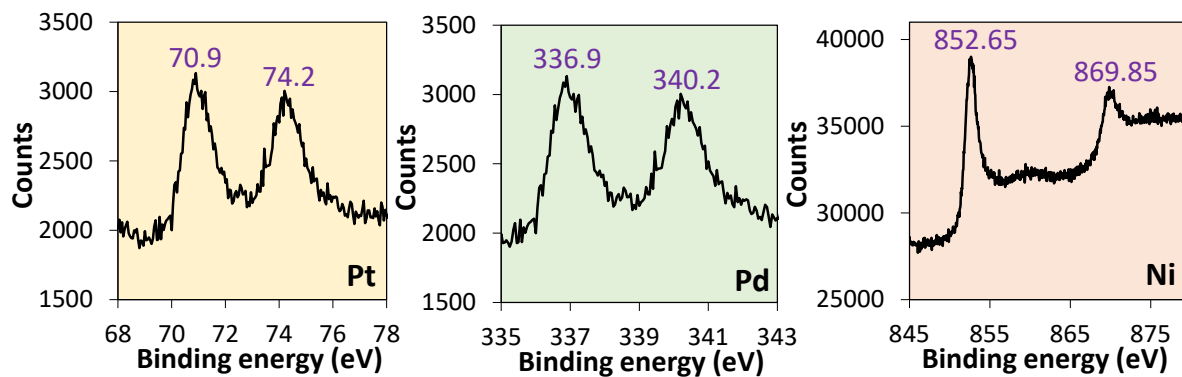


Fig. S4 Elemental and line mapping of synthesized samples with controlled OAm/Pt and TOP/Pd molar ratio of (a) 1.4 and 1 and (b) 1.4 and 3, respectively.

(A) Pt-rich shell



(B) Pd-rich shell

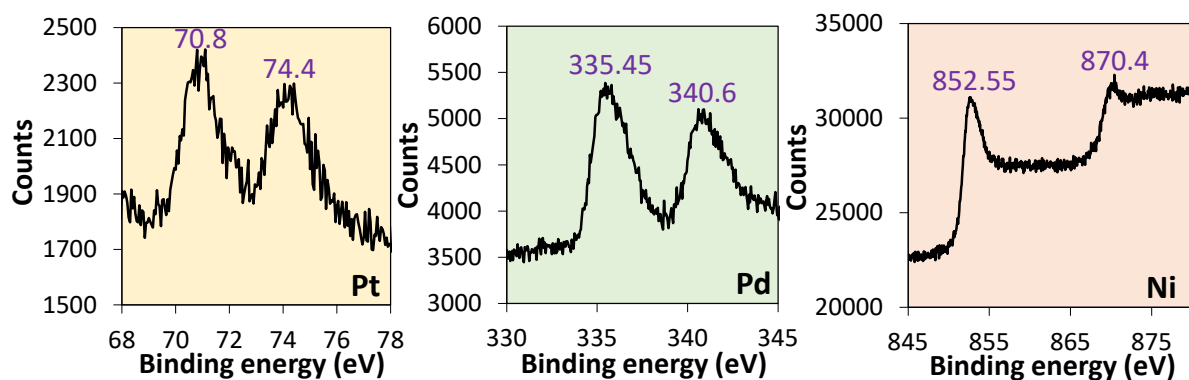


Fig. S5 XPS spectra in the regions of Pt 4f, Pd 3d and Ni 2p for (A) Pt-rich and (B) Pd-rich shell of NiPtPd nanoparticles.