Supporting Information for

Controlled Synthesis of High Metal Loading Pt based Electrocatalysts with Enhanced Activity and Durability toward Oxygen Reduction Reaction

Shushuang Li,[a] Huiyuan Liu,[a] Ying Wang,[a,b] Wei Xu,[a,b] Jia Li,[a,b] Yuan Liu,[a] Xinwen Guo,[b] and Yujiang Song*[,a]

[a] Dalian National Laboratories for Clean Energy (DNL), Dalian Institute of Chemical Physics (DICP), Chinese Academy of Sciences, 457 Zhongshan Road, Dalian 116023, P. R. China. Fax: 8641184379170; Tel: 8641184379831; E-mail: yjsong@dicp.ac.cn

[b] Division of Chemical, Environmental and Biological Science and Technology, Dalian University of Technology, Dalian 116024, P. R. China.

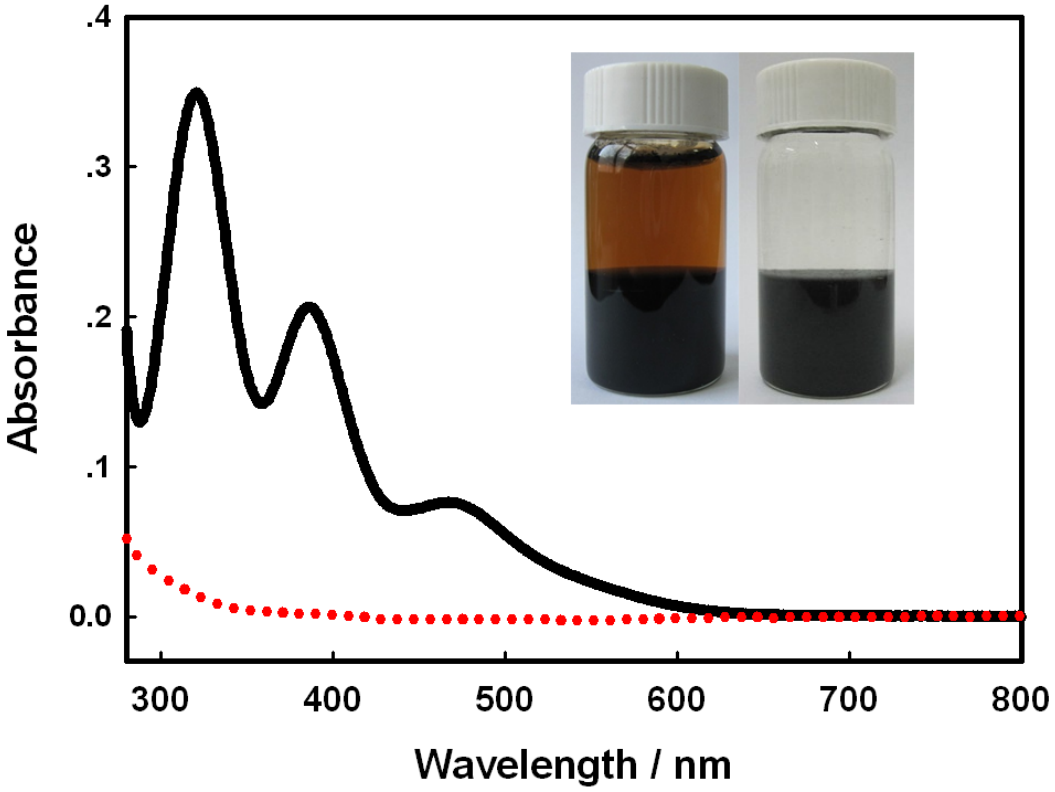

Figure S1. UV-visible spectrum of 20 mM Pt(II) in aqueous phase before (black) and after 1h of phase transfer process (red line). Insets: Respective photos of the reaction system before (left) and after (right) phase transfer process.

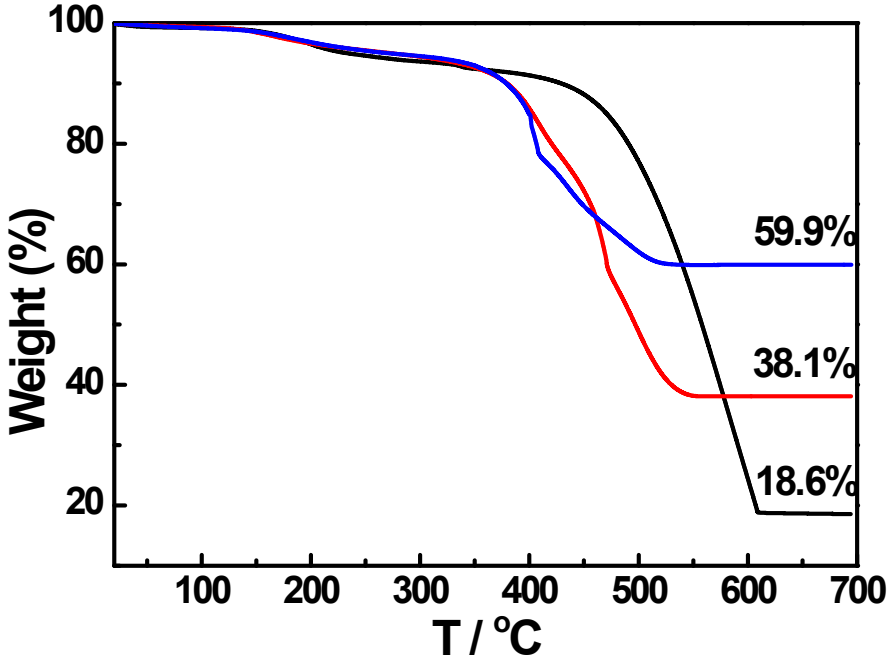

Figure S2. TG diagram of obtained Pt/C electrocatalyst at different metal loadings. The weight loss below 100 °C is due to the release of adsorbed water molecules, and the weight loss in the range of 100-400 °C may come from Pt-catalyzed slow pyrolysis of carbon species, and the sharp weight loss beginning at 400 °C corresponds to the burning of carbon black.

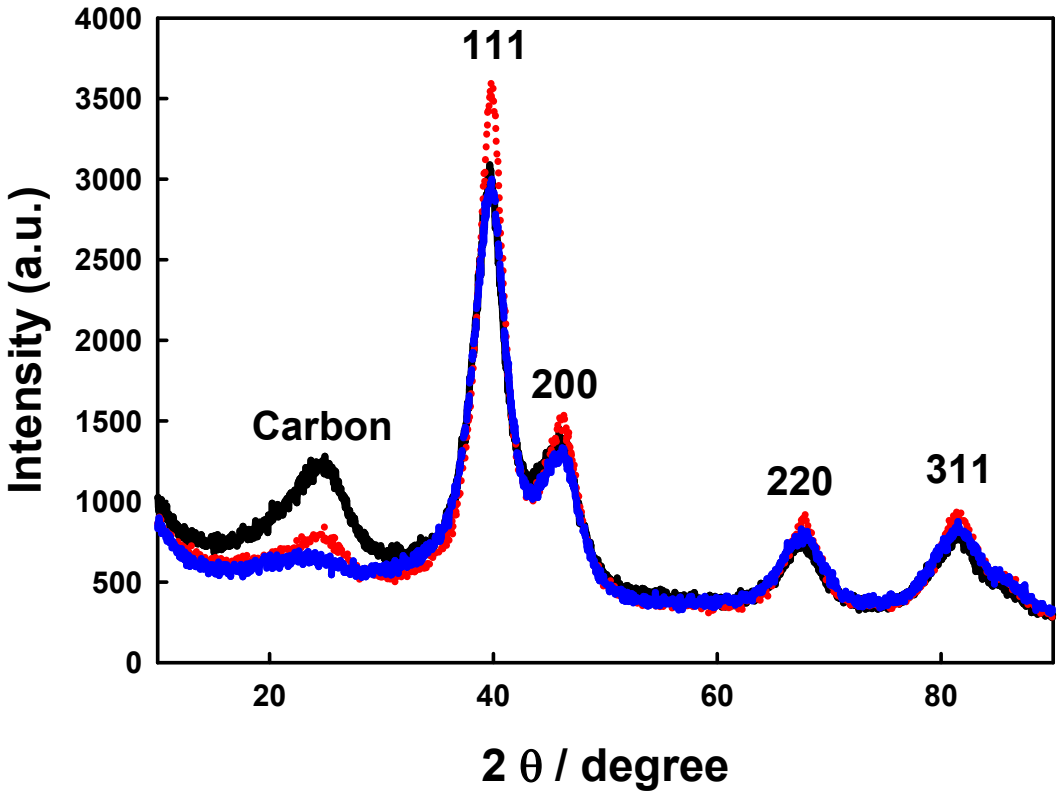

Figure S3. XRD pattern of synthesized Pt/C at varied metal loading: 18.6% (black), 38.1% (red), 59.9% (blue)

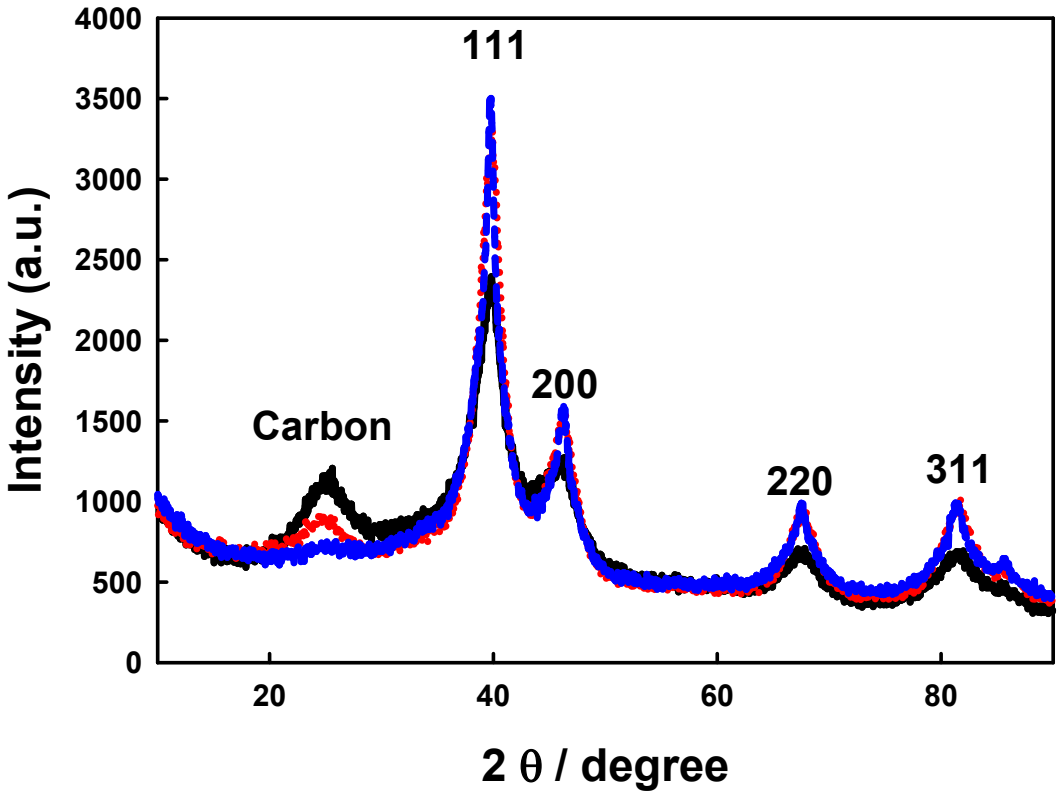

Figure S4. XRD pattern of commercial Pt/C at varied metal loading: 20% (black), 40% (red), 60% (blue)

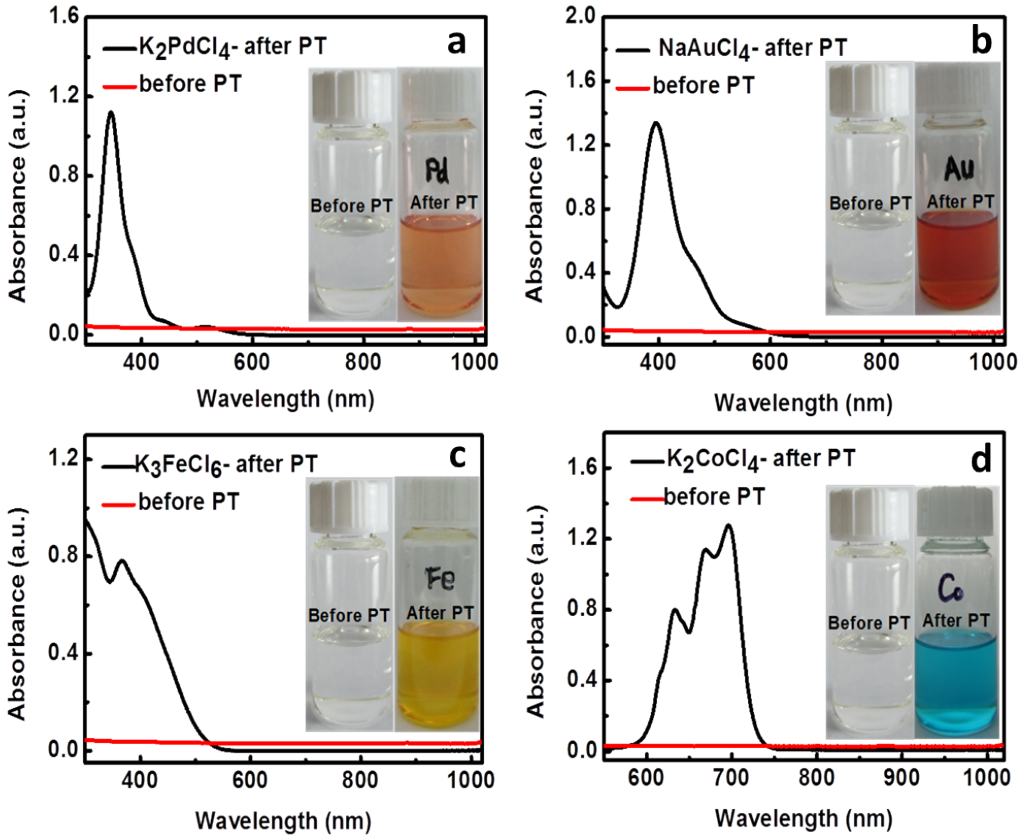

Figure S5. UV-visible spectra and photographs of K_2PdCl_4 (20 mM) (a), $NaAuCl_4$ (20 mM) (b), K_3FeCl_6 (19 mM) (c), and K_2CoCl_4 (9 mM) (d) in chloroform before (red) and after (black) phase transfer process.

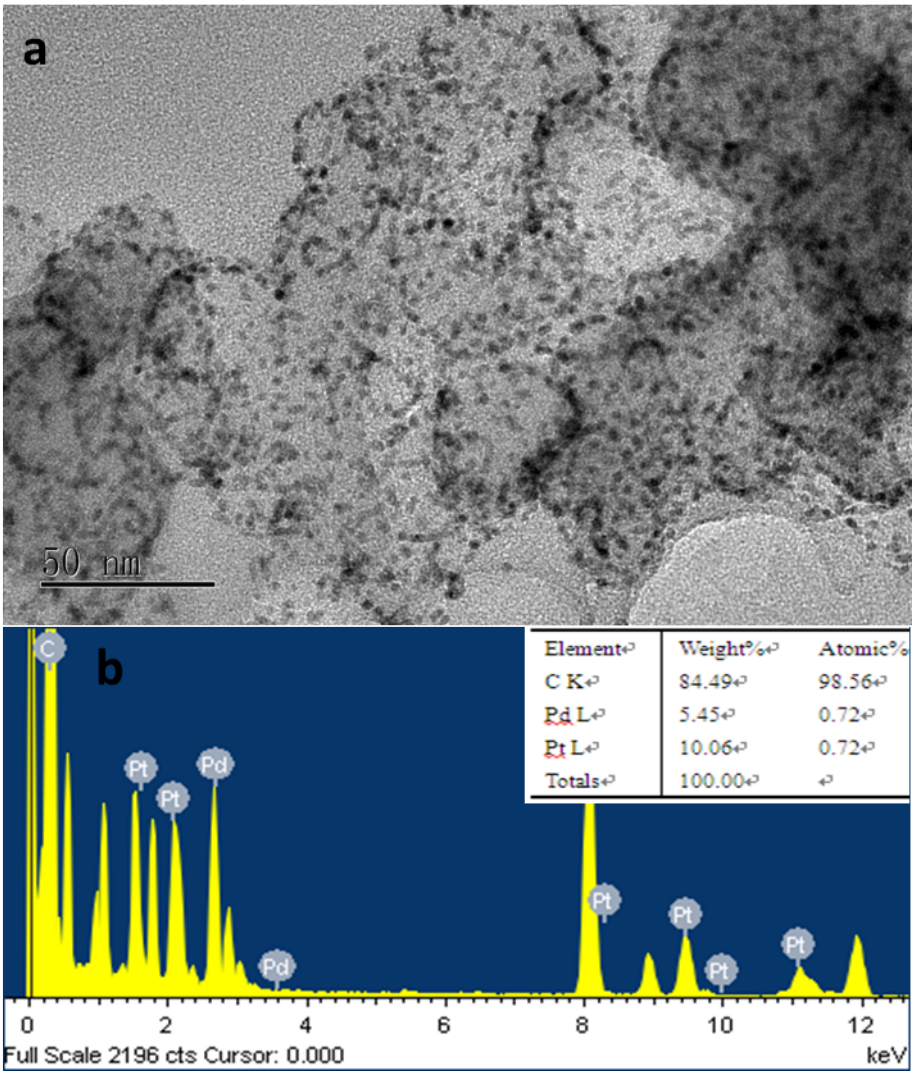

Figure S6. TEM image (a) and EDX spectrum (b) of PtPd/C electrocatalyst synthesized by using metallic ions-containing reversed micelles. (Inset: elemental analysis based on the EDX spectrum.)

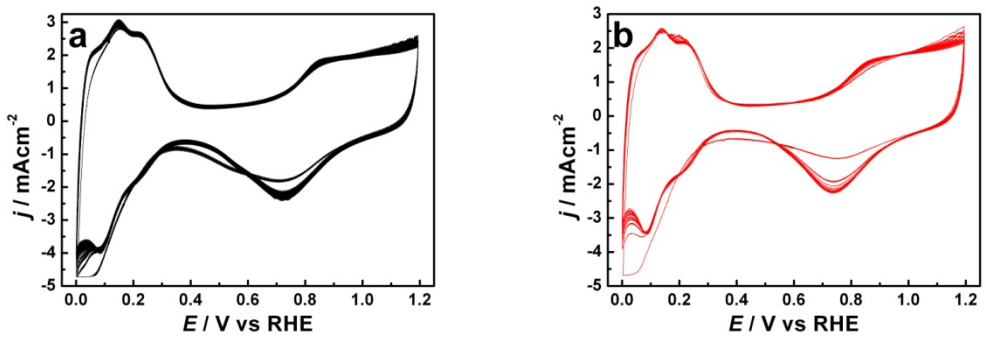

Figure S7. Initial 10 consecutive CV curves for 59.9 wt% Pt/C (red) and commercial 60 wt% Pt/C (black) in N_2-purged $HClO_4$ (0.1 M) aqueous solution at 25 ^oC (0-1.2 V vs RHE, sweep rate 100 mVS^{-1}). Reaction conditions: 13 mg EC-600, 10 mL of 20 mM Pt(II) and10 mL of 40 mM CTAB in chloroform; 10 mL of 300 mM $NaBH_4$ in water; 90 mL of water; stirring at 1600 rpm.

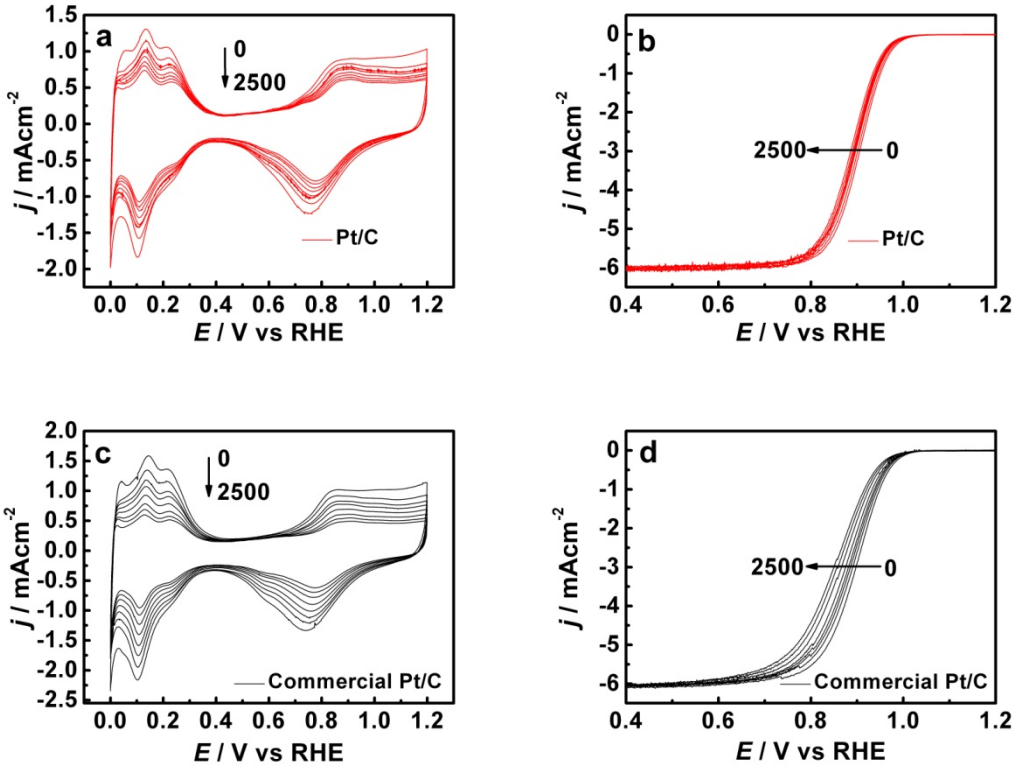

Figure S8. CV curves for 59.9 wt% Pt/C (a) and commercial 60 wt% Pt/C (c), and ORR polarization curves for 59.9 wt% Pt/C (b) and commercial 60 wt% Pt/C (d) (0.6-1.2 V vs. RHE, 100 mVs^{-1}, 0.1 M O_2-purged $HClO_4$). Reaction conditions: 13 mg EC-600, 10 mL of 20 mM Pt(II) and10 mL of 40 mM CTAB in chloroform; 10 mL of 300 mM $NaBH_4$ in water; 90 mL of water; stirring at 1600 rpm.

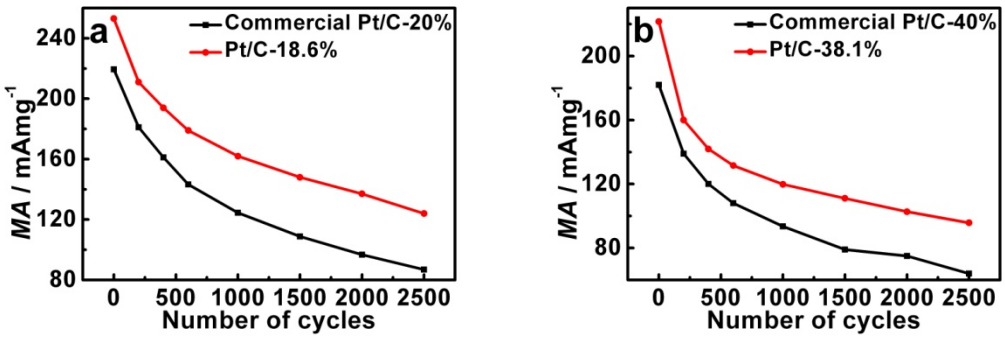

Figure S9 MA value of 18.6 wt% Pt/C (a) and 38.1 wt% Pt/C (b) recorded during the process of potential cycling (0.6-1.2 V vs. RHE, 100 mVs^{-1}, 0.1 M O_2-purged $HClO_4$). Reaction conditions: 117 mg (18.6 wt%) and 39 mg (38.1 wt%) VXC-72, 10 mL of 20 mM Pt(II) and 10 mL of 40 mM CTAB in chloroform; 10 mL of 300 mM $NaBH_4$ in water; 90 mL of water; stirring at 1600 rpm.