Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

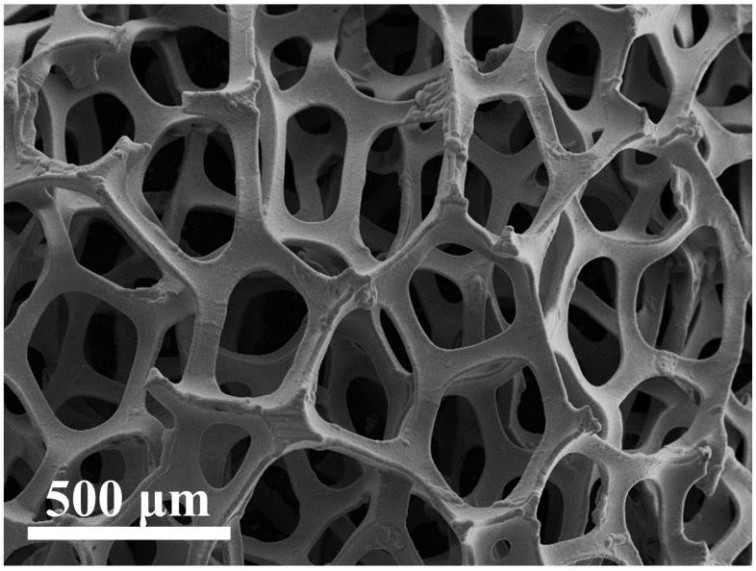

Fig. S1 SEM image of the mPtRu-NF.

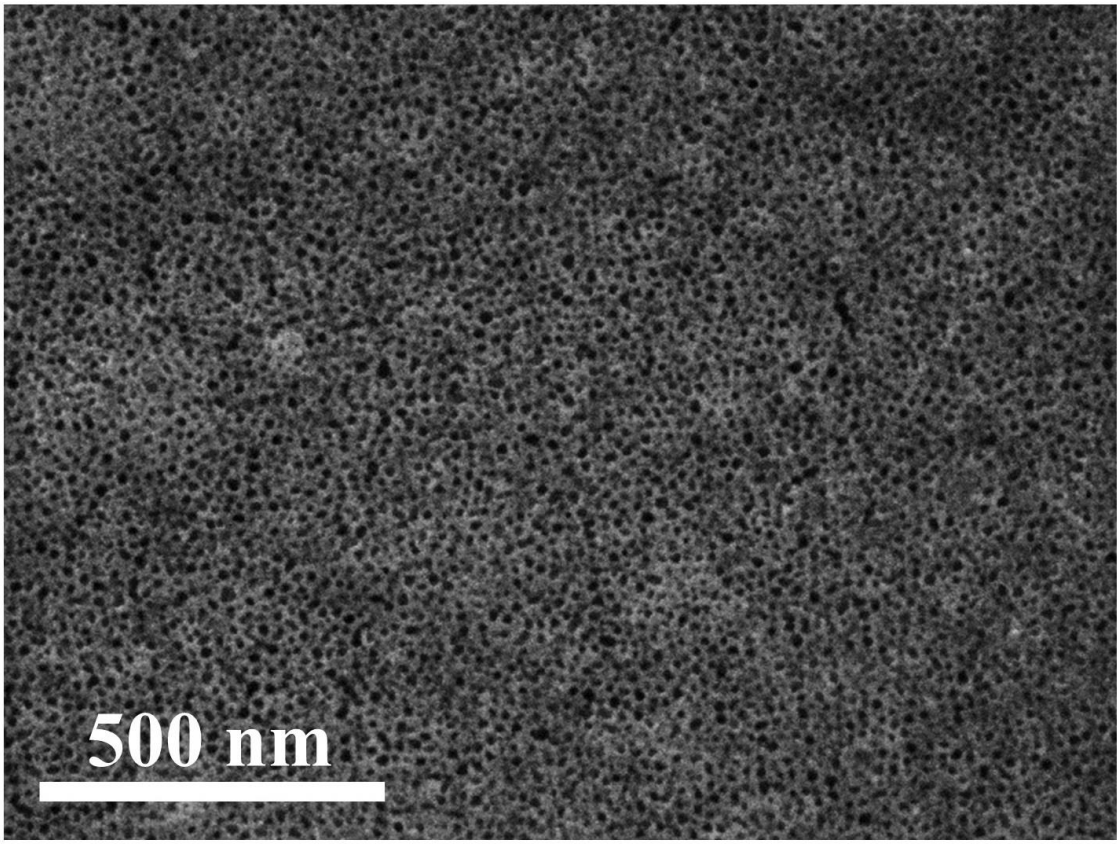

Fig. S2 SEM image of the mPtRu-NF.

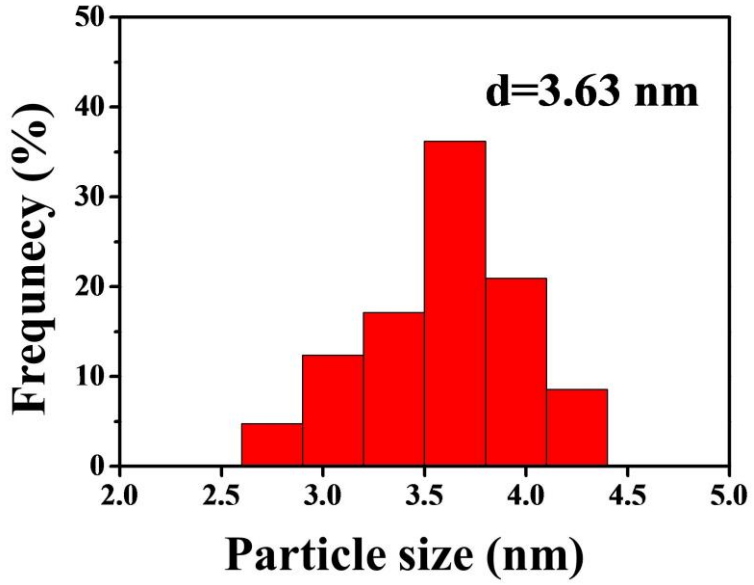

Fig. S3 The particle size distribution histogram of PtRu nanoparticles.

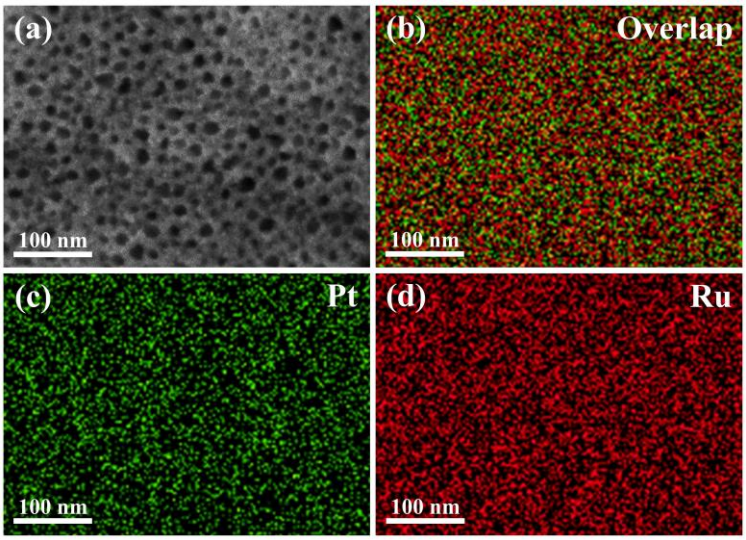

Fig. S4 (a) SEM image and (b, c and d) elemental mapping images of the mPtRu-NF.

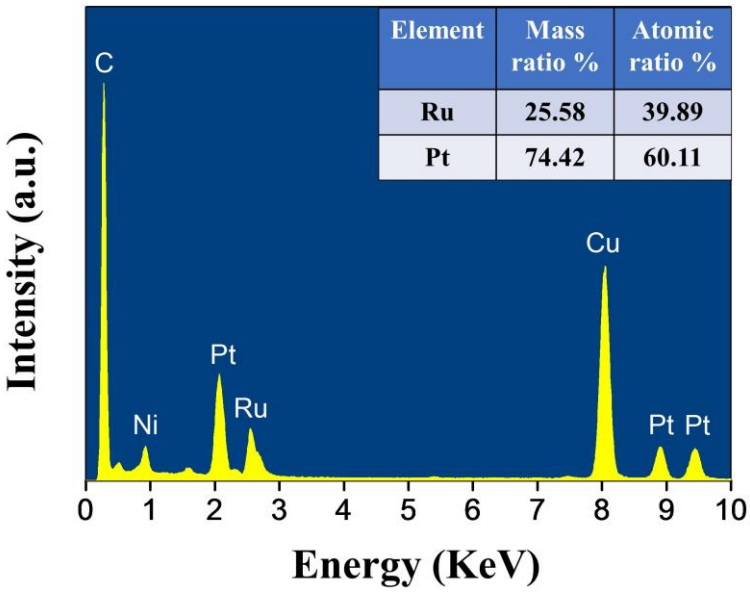

Fig. S5 TEM-EDX image of the mPtRu-NF.

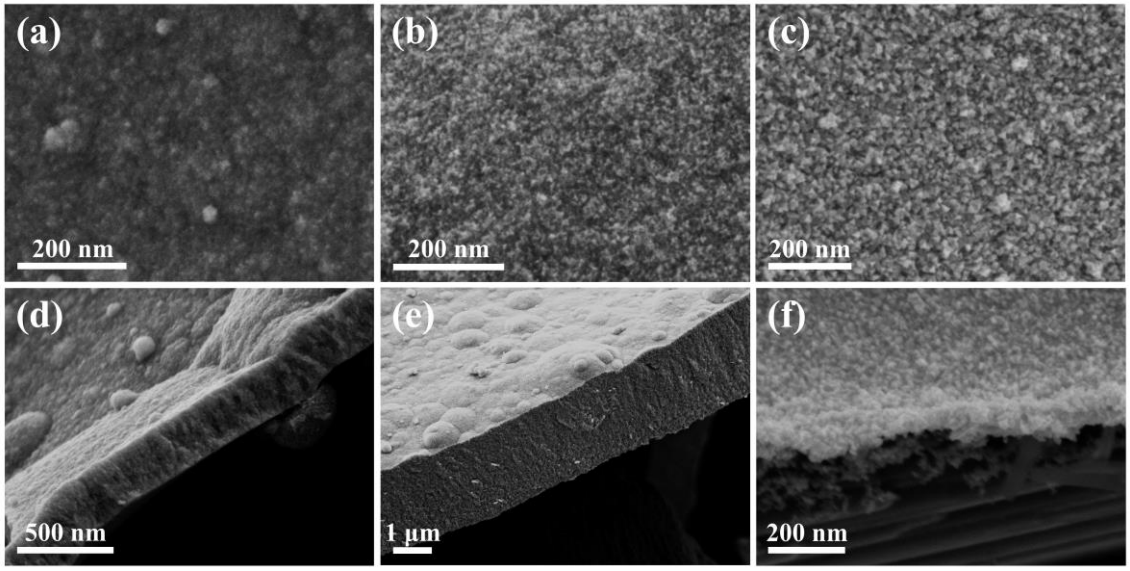

Fig. S6 SEM images of the top-surface and cross-section views of the PtRu-NF prepared by replacing F127 with (a, d) Brij 58, (b, e) PVP, and (c, f) without surfactants, respectively, under the typical conditions used for the typical synthesis.

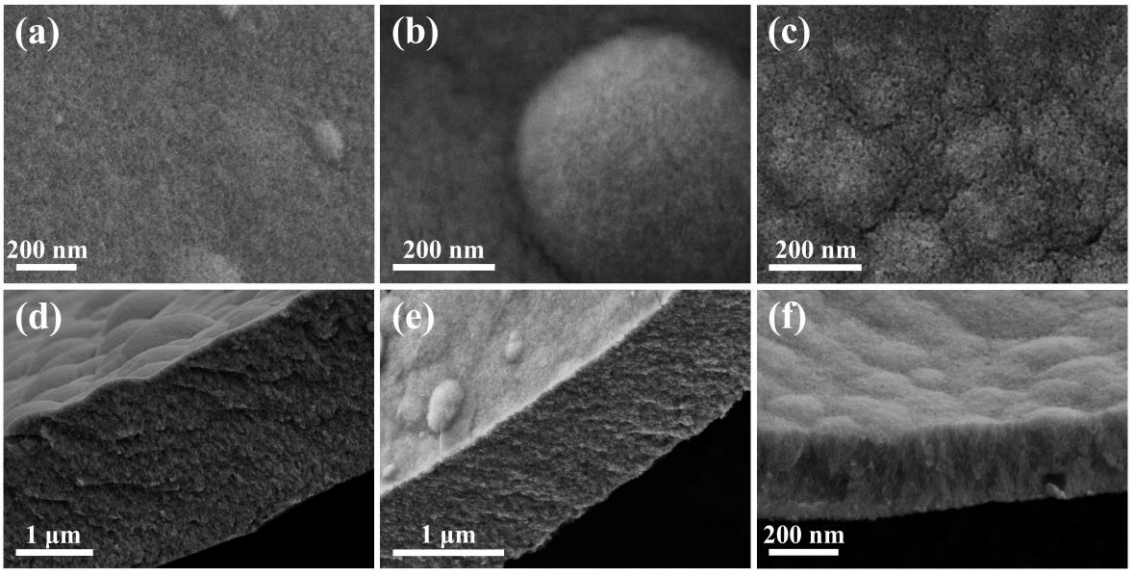

Fig. S7 SEM images of the top-surface and cross-section views of the samples prepared under the typical conditions with (a, d) 0 μL, (b, e) 5 μL and (c, f) 125 μL HCl (6 M), respectively.

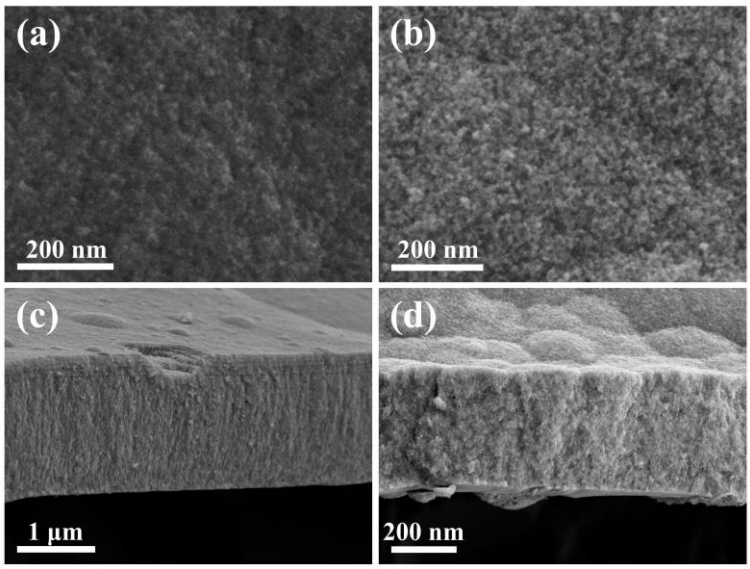

Fig. S8 SEM images of the top-surface and cross-section views of the samples prepared by replacing HCl with (a, c) HNO_3 and (b, d) H_2SO_4, respectively, under the typical conditions used for the typical synthesis.

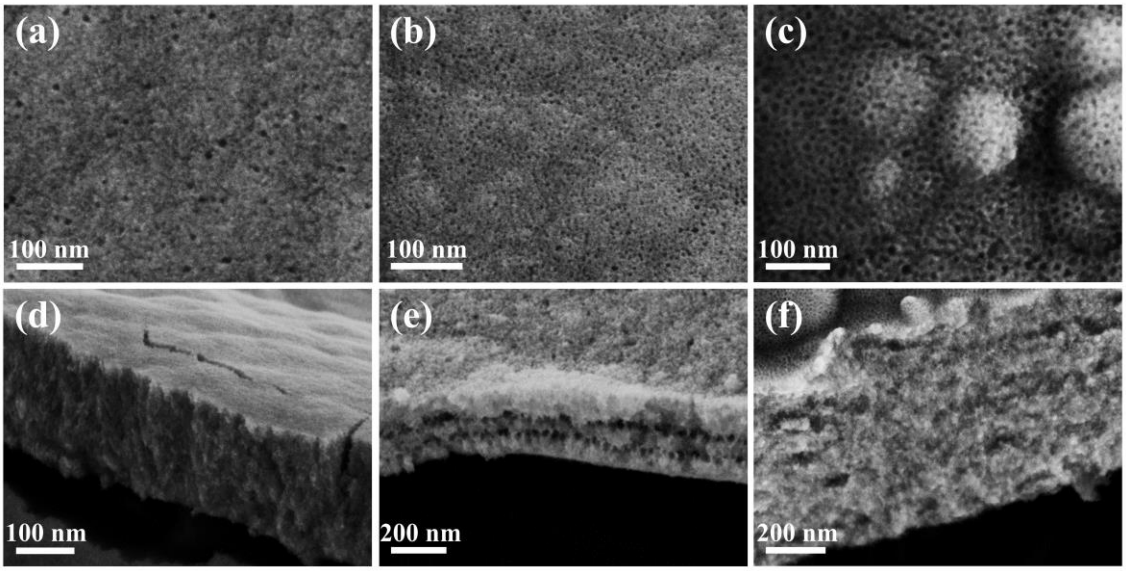

Fig. S9 SEM images of the top-surface and cross-section views of the samples prepared under the typical conditions for (a, d) 3 h, (b, e) 6 h and (c, f) 24 h, respectively.

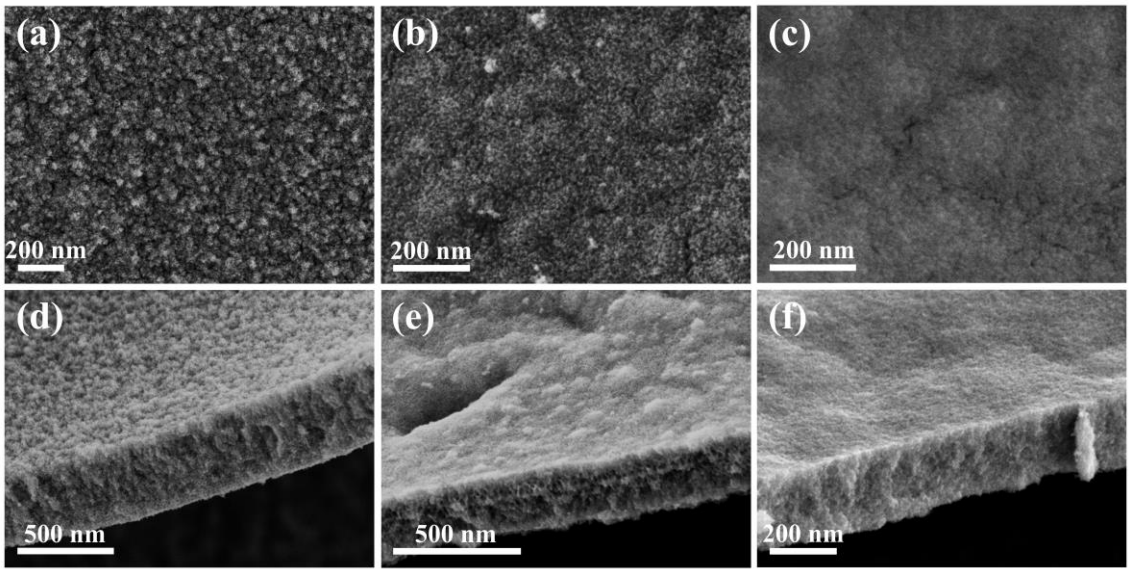

Fig. S10 SEM images of the top-surface and cross-section views of the samples prepared with different amounts of the metallic precursors. The added amounts of metallic precursors, K_2PtCl_4 and $RuCl_3$ are (a, d) 3.0 mL and 0 mL (Pt-NF), (b, e) 2.5 mL and 0.5 mL (Pt_5Ru-NF), (c, f) 0.5 mL and 2.5 mL ($PtRu_5$-NF), respectively.

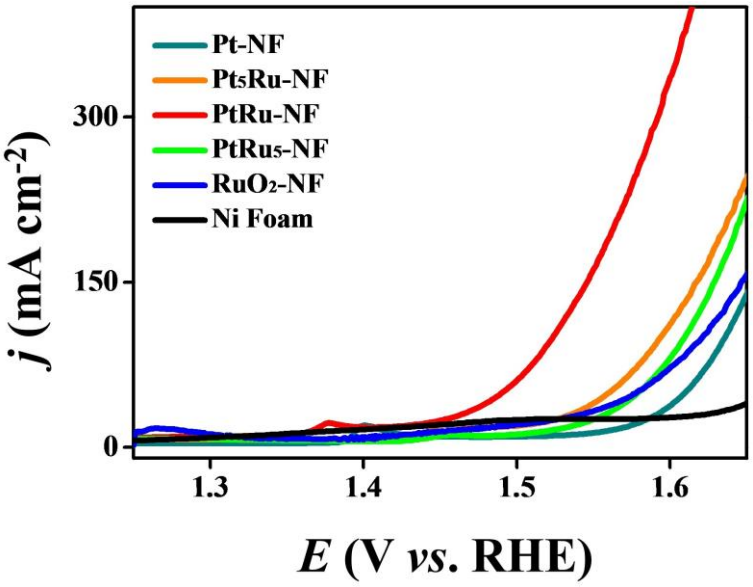

Fig. S11 OER polarization curves. The LSVs for OER were recorded in a 1 M KOH solution at a sweep rate of 5 mV s^{-1}.

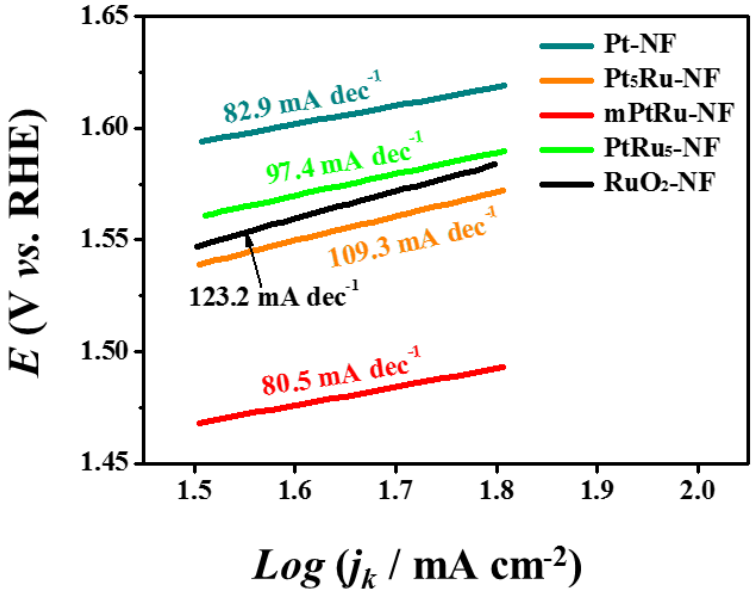

Fig. S12 Tafel slopes of OER for the different samples.

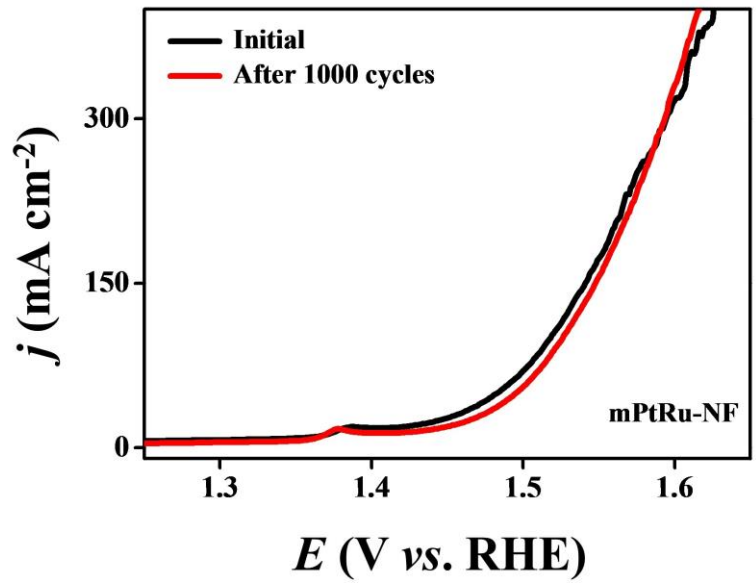

Fig. S13 OER polarization curves before and after durability test for the mPtRu-NF.

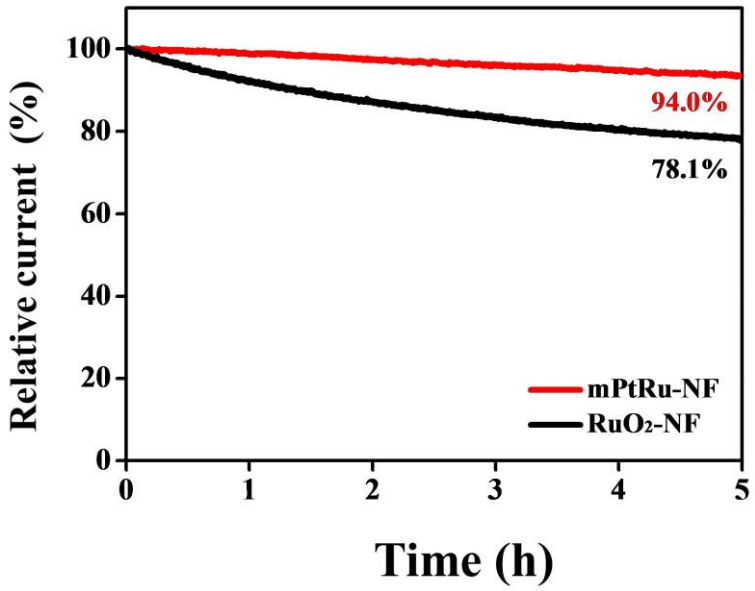

Fig. S14 Chronoamperometric measurements of the samples tested at 1.5 V.

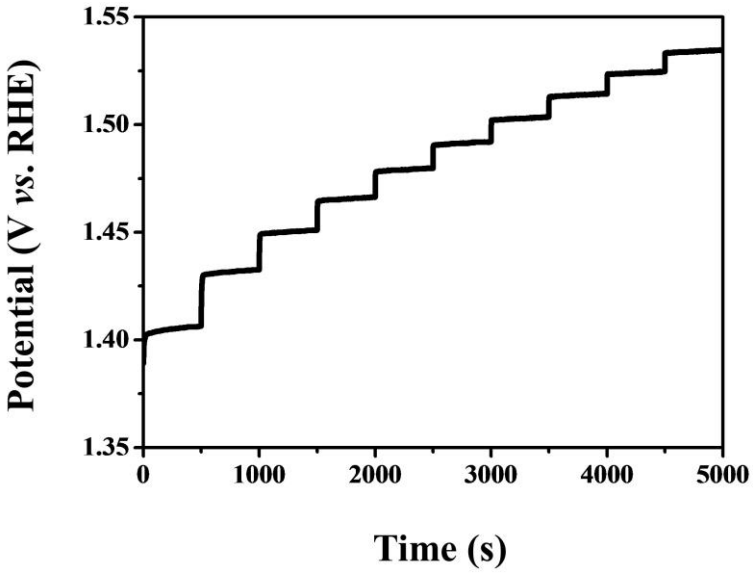

Fig. S15 Multicurrent process of mPtRu-NF. The current density started at 4 mA cm^{-2} and ended at 40 mA cm^{-2}, using an increment of 4 mA cm^{-2} per 500 s without iR correction.

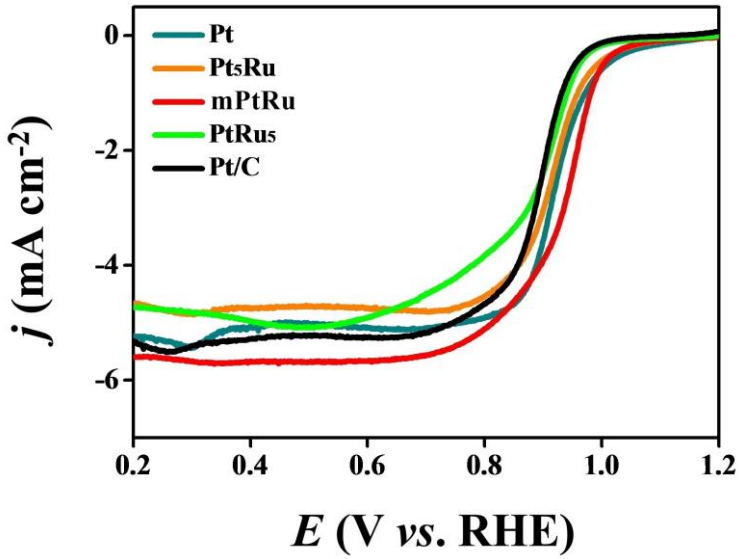

Fig. S16 ORR polarization curves of the different samples. The LSVs for ORR were recorded in an O_2-saturated 1 M KOH solution at a sweep rate of 5 mV s^{-1} with a rotation rate of 1600 rpm.

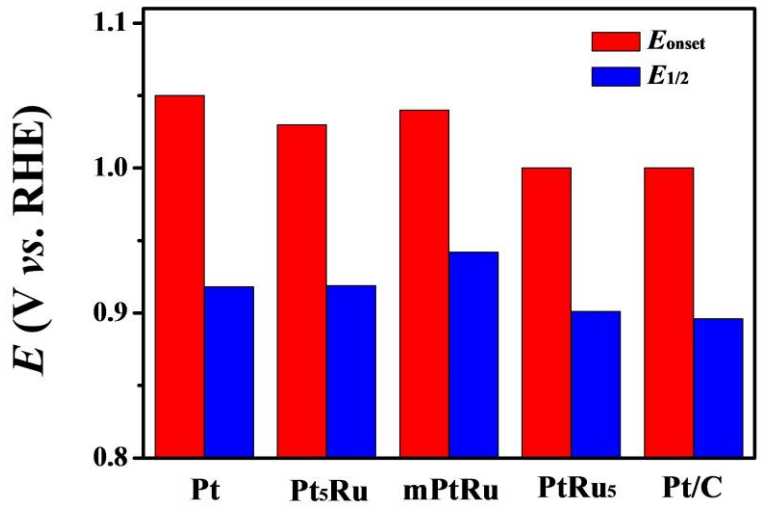

Fig. S17 The comparisons of E_{onset} and $E_{1/2}$ for the different samples.

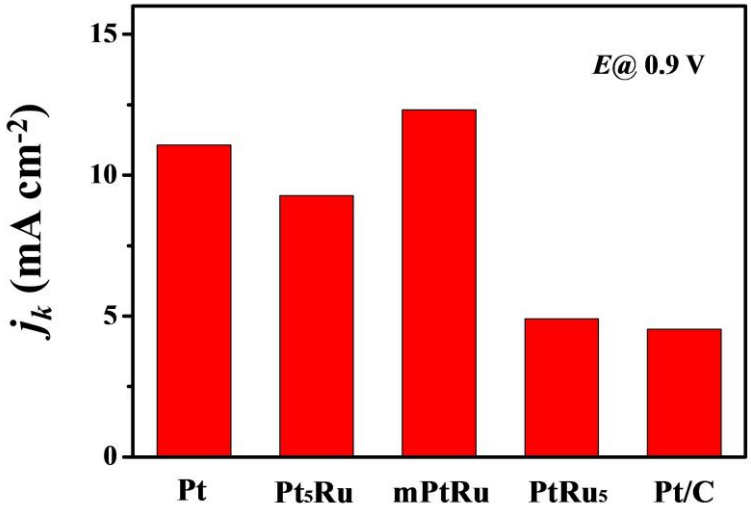

Fig. S18 The comparison of j_k at 0.9 V for the different samples.

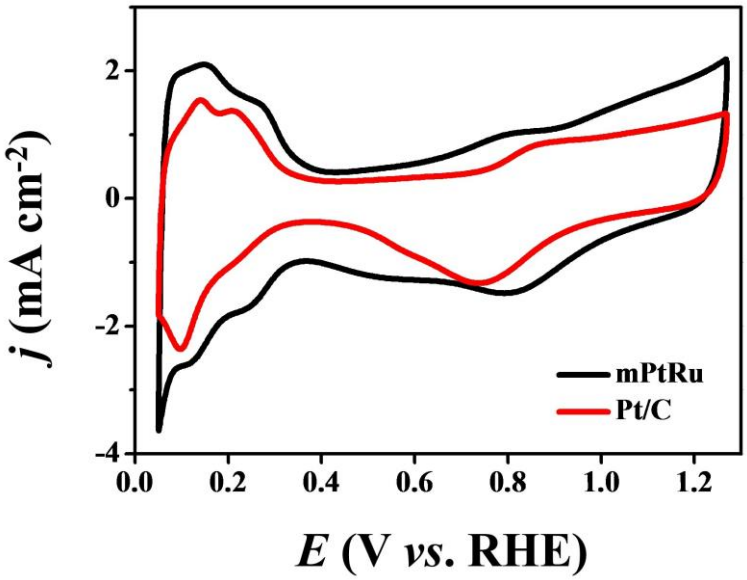

Fig. S19 The CV curves of mPtRu and Pt/C in 0.5 M H_2SO_4 solution at a scan rate of 50 mV s^{-1}.

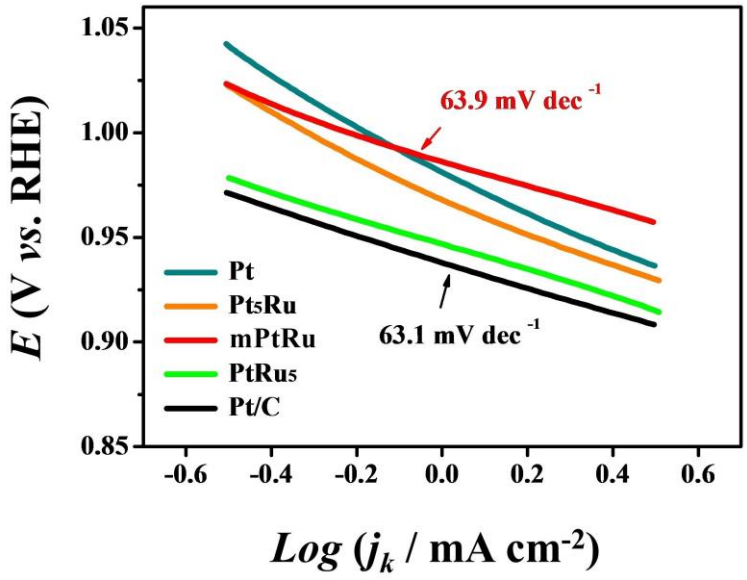

Fig. S20 Tafel slopes of ORR for the different samples.

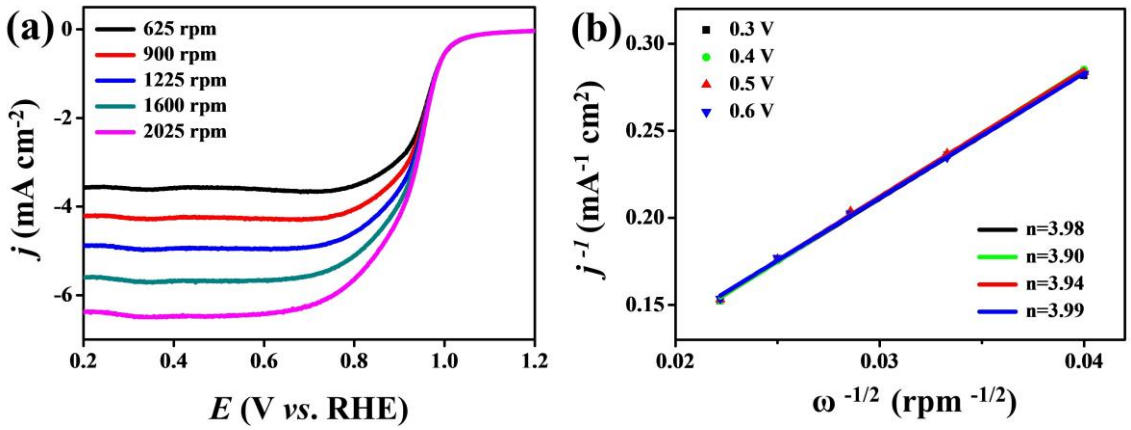

Fig. S21 (a) ORR polarization curves of the mPtRu with different RDE rotation rates. (b) The electron transfer numbers at different potentials. The LSVs were recorded in an O_2-saturated 1 M KOH solution at a sweep rate of 5 mV s^{-1}.

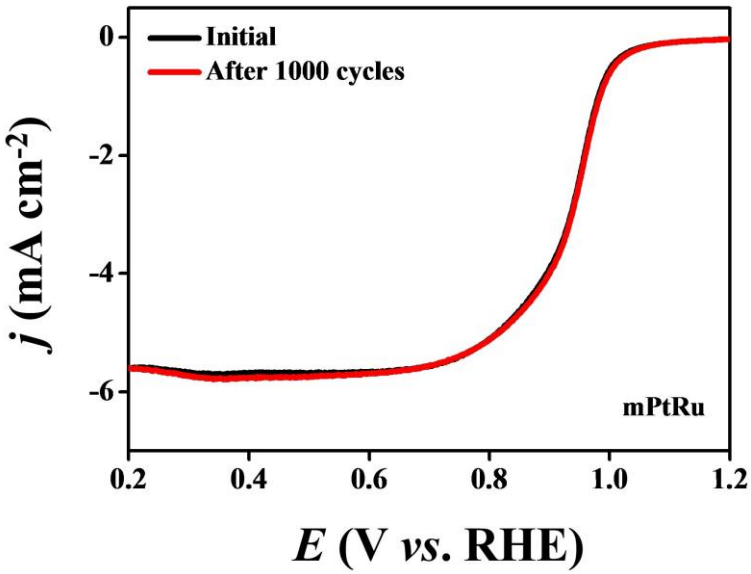

Fig. S22 ORR polarization curves before and after durability test for the mPtRu.

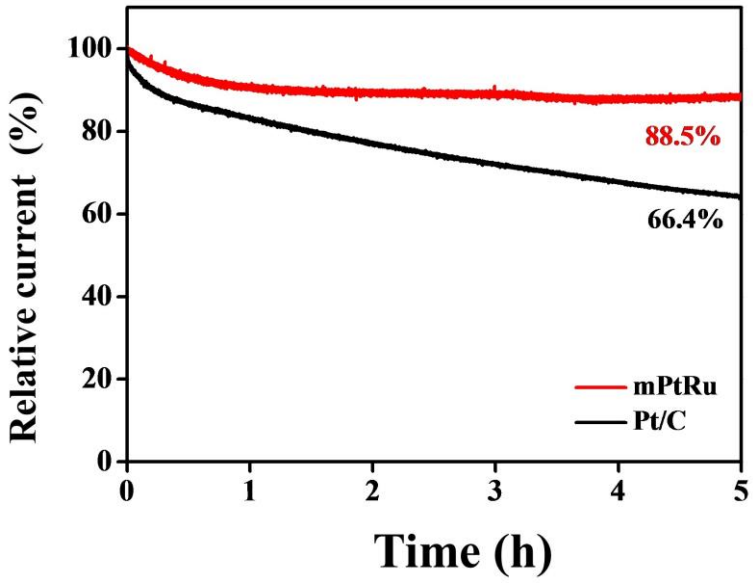

Fig. S23 Chronoamperometric measurements of the samples tested at 0.9 V.