Electronic Supplementary Information

Sequential Galvanic Replacement Mediated Pd-Doped Hollow Ru-Te Nanorods for Enhanced Hydrogen Evolution Reaction Mass Activity in Alkaline Media

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1. Supplementary Results

Figure S1. SEM images of (a) RuTeNRs and (b) PdRuTeNRs. The scale bar is 500 nm.

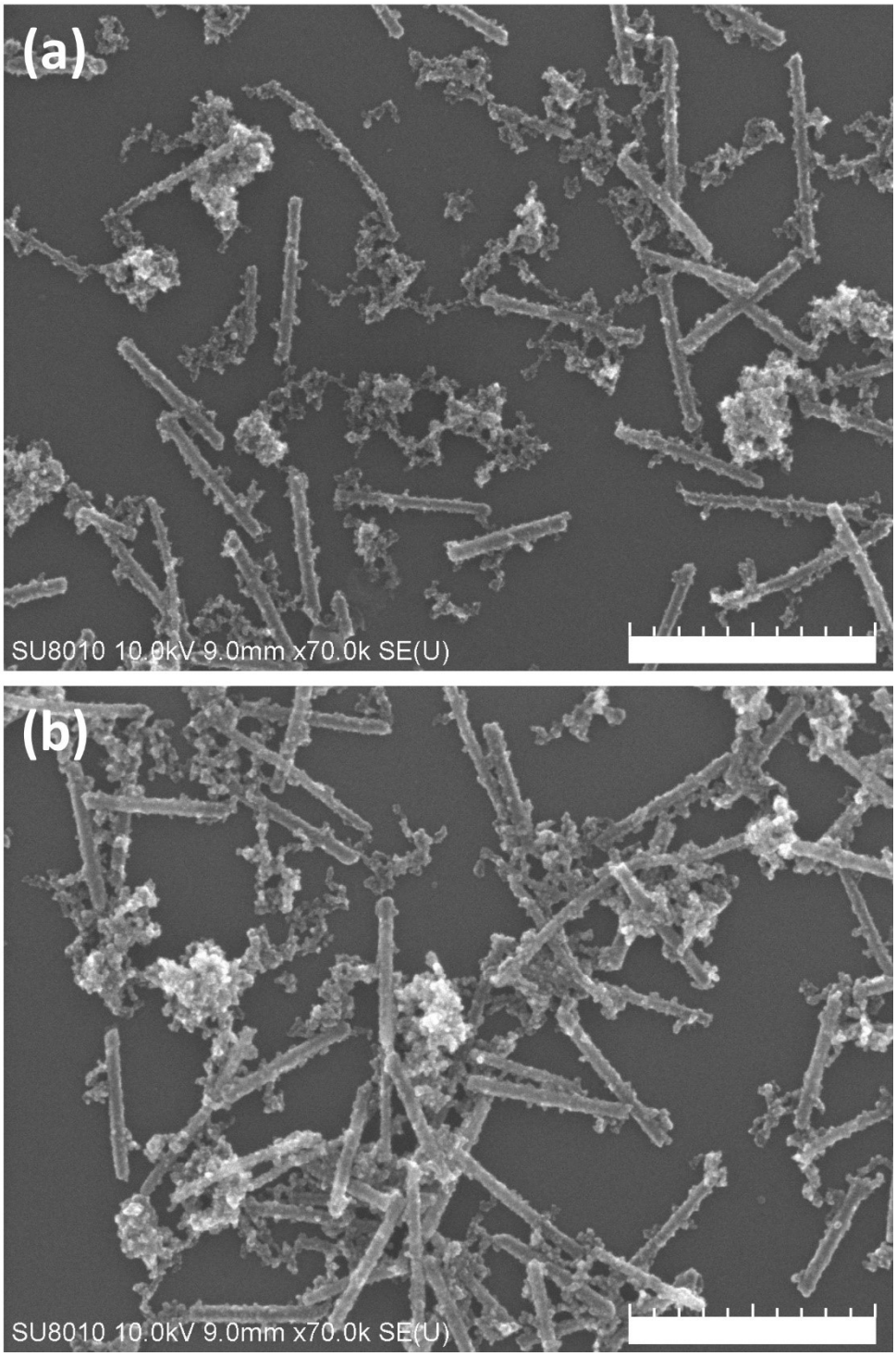

Table S1. The element content in RuTeNRs and PdRuTeNRs.

Catalyst	Pd	Ru	Te
RuTeNRs	-	68 %	32 %
PdRuTeNRs	21 %	52 %	28 %

Figure S2. LSV curve for Pt/C, PdTe, RuTe, PdRuTe NRs, Pd, Ru, Te and RuO_2.

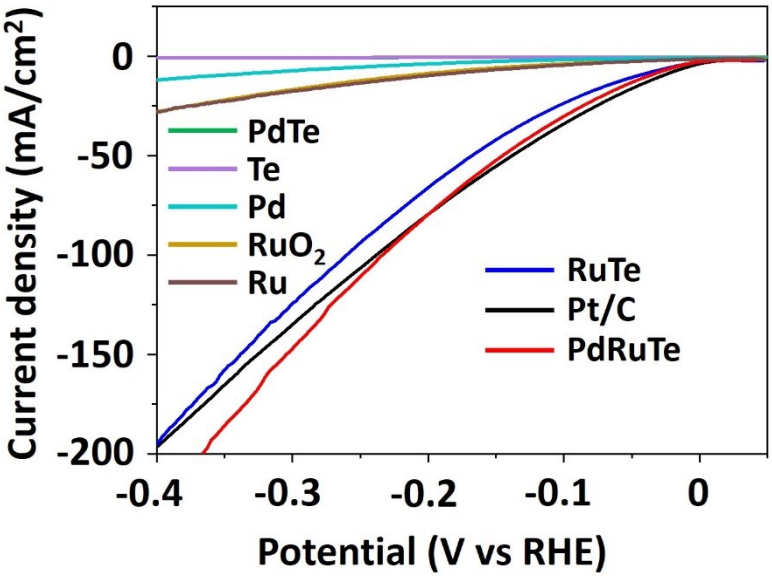

Figure S3. The CV curves of (a) RuTe and (b) PdRuTe measured at different scan rate of 20, 40, 60, 80, 100 mV s^{-1}.

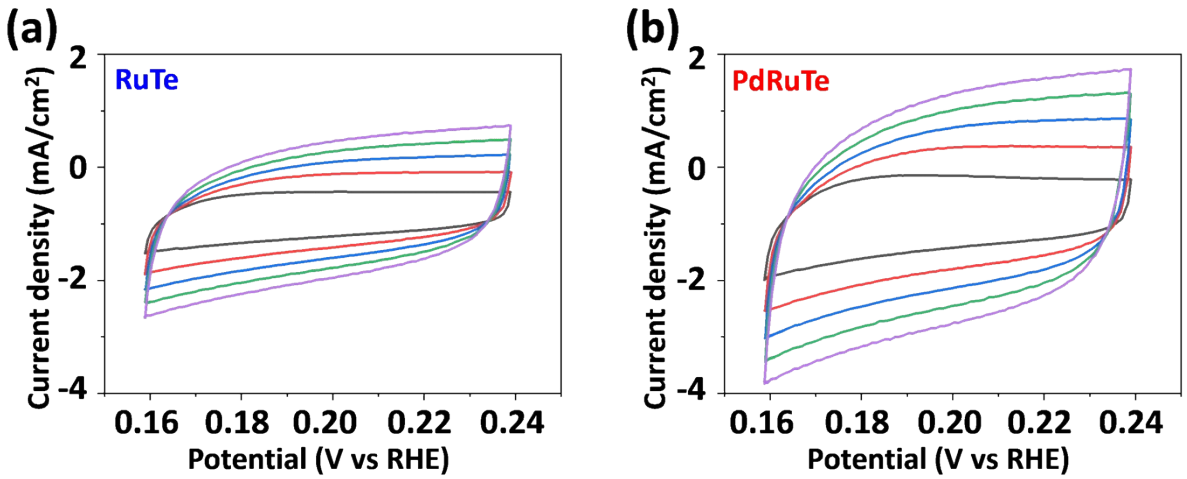

Figure S4. CV scan in the range of 0 to 1.2 V at 50 mV·s-1 for Pd, Ru, and RuO_2.

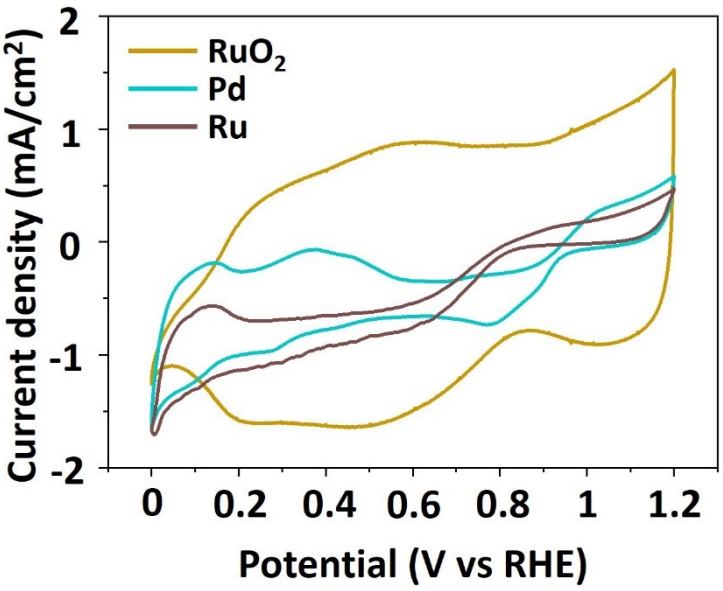

Figure S5. The equivalent circuit used for approximation of the EIS data.

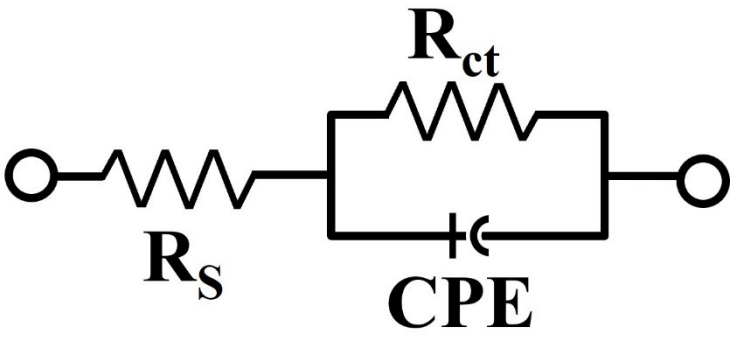

Table S2. R_{ct} at various potentials of 50 mV, 100 mV, 150 mV, and 200 mV.

Catalyst	R_{ct} at 50 mV	R_{ct} at 100 mV	R_{ct} at 150 mV	R_{ct} at 200 mV
RuTeNRs	4.6 Ω	11.3 Ω	29.3 Ω	45.4 Ω
PdRuTeNRs	3.3 Ω	9.3 Ω	25.1 Ω	33.3 Ω
Pt/C	5.7 Ω	12.2 Ω	37.8 Ω	62.2 Ω

Figure S6. HER stability tests. (a) Accelerated stability measurements by recording the polarization curves for the RuTe and PdRuTe before and after 2,000 cyclic voltammograms at a scan rate of 50 mV s^{-1}. (b) Chronoamperometric tests of PdRuTe conducted at -100 mV.

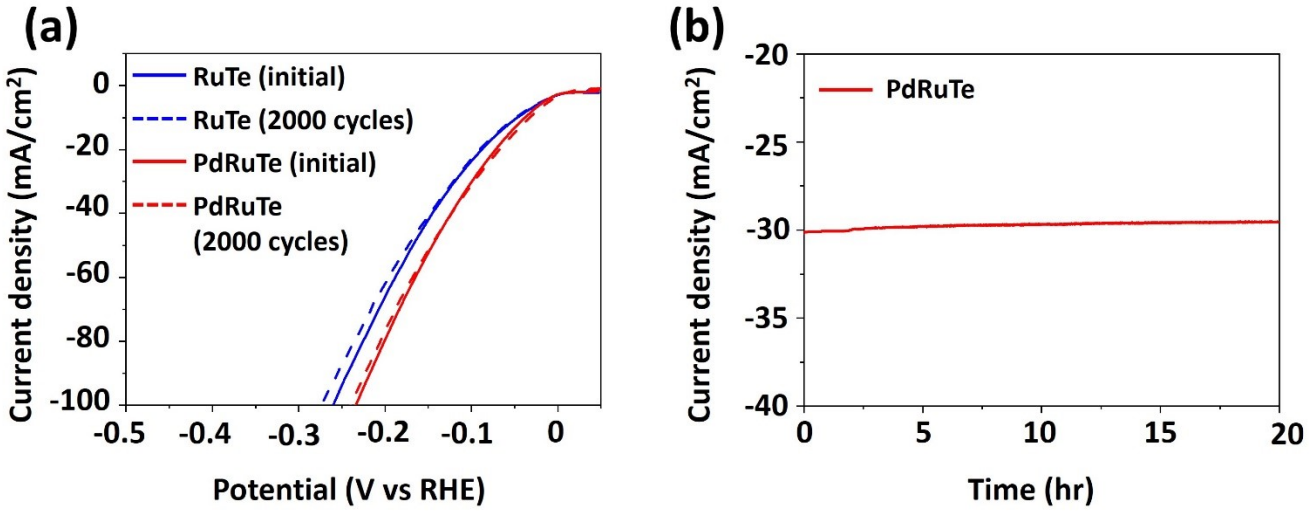

Table S3. Comparison of Ru-based electrocatalysts for hydrogen evolution reaction reported in the literatures.

Ru-based electroatalyst	Overpotential @10mAcm^{-2}	Tafel slope	Electrolyte	Reference
PdRuTeNRs	37 mV	63.6 mV dec^{-1}	1 M KOH	This work
RuTeP	35 mV	30.8 mV dec^{-1}	1 M KOH	[45]
$RuTe_2$	36 mV	-	1 M KOH	[46]
Ru_2NI_1 SNs/C	40 mV	25 mV dec^{-1}	1 M KOH	[47]
Au-Ru-2NWs	50 mV	30.8 mV dec^{-1}	1 M KOH	[48]
Ru_2P@NPC	52 mV	69 mV dec^{-1}	1M KOH	[49]
Pd_3Ru	52 mV	-	1 M KOH	[50]
RuP_x@NPC	74 mV	46 mV dec^{-1}	1 M KOH	[51]
$Ru/C_3N_4/C$	79 mV	-	1 M KOH	[52]
Te@Ru-0.6/C	86 mV	36 mV dec^{-1}	1 M KOH	[53]
RuO_2 NRs/C/SS	121 mV	99.4 mV dec^{-1}	0.5 M H_2SO_4	[54]

Figure S7. The comparison of Ru-based electrocatalysts overpotential at 10 $mAcm^{-2}$.