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

Electronic Supplementary Information

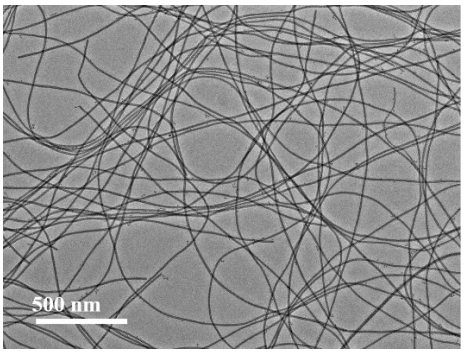


Fig. S1 TEM image of the Te NWs.

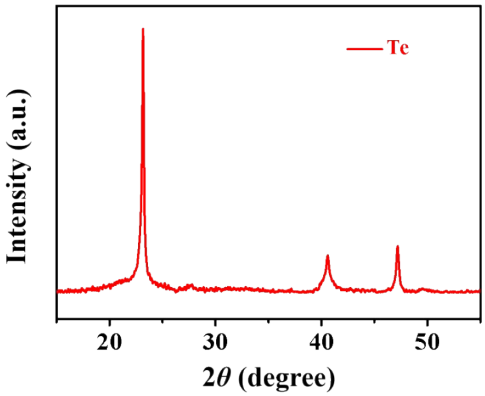


Fig. S2 XRD pattern of the Te NWs.

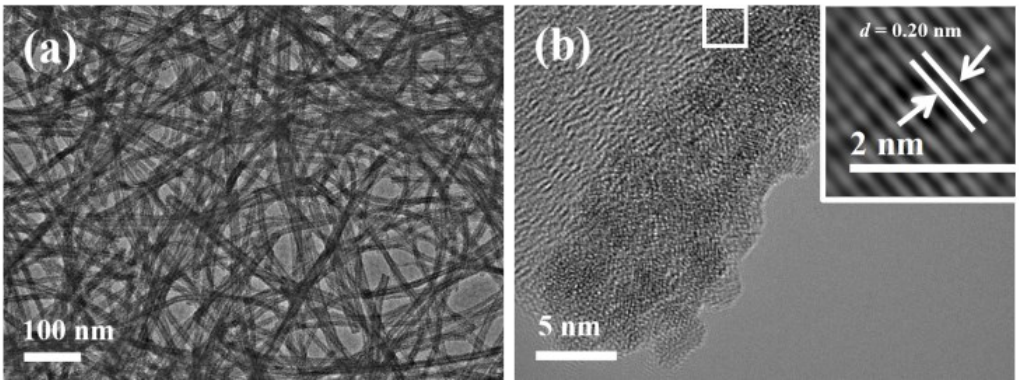


Fig. S3 (a) TEM and (b) HRTEM images of the RuTe ($Ru_{0.40}Te$) NTs. The inset in (b) is the lattice fringes in the square area in (b).

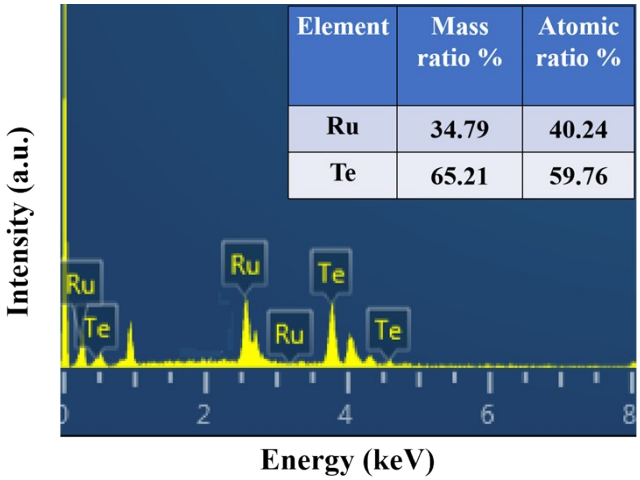


Fig. S4 EDX spectrum of the RuTe ($Ru_{0.40}Te$) NTs.

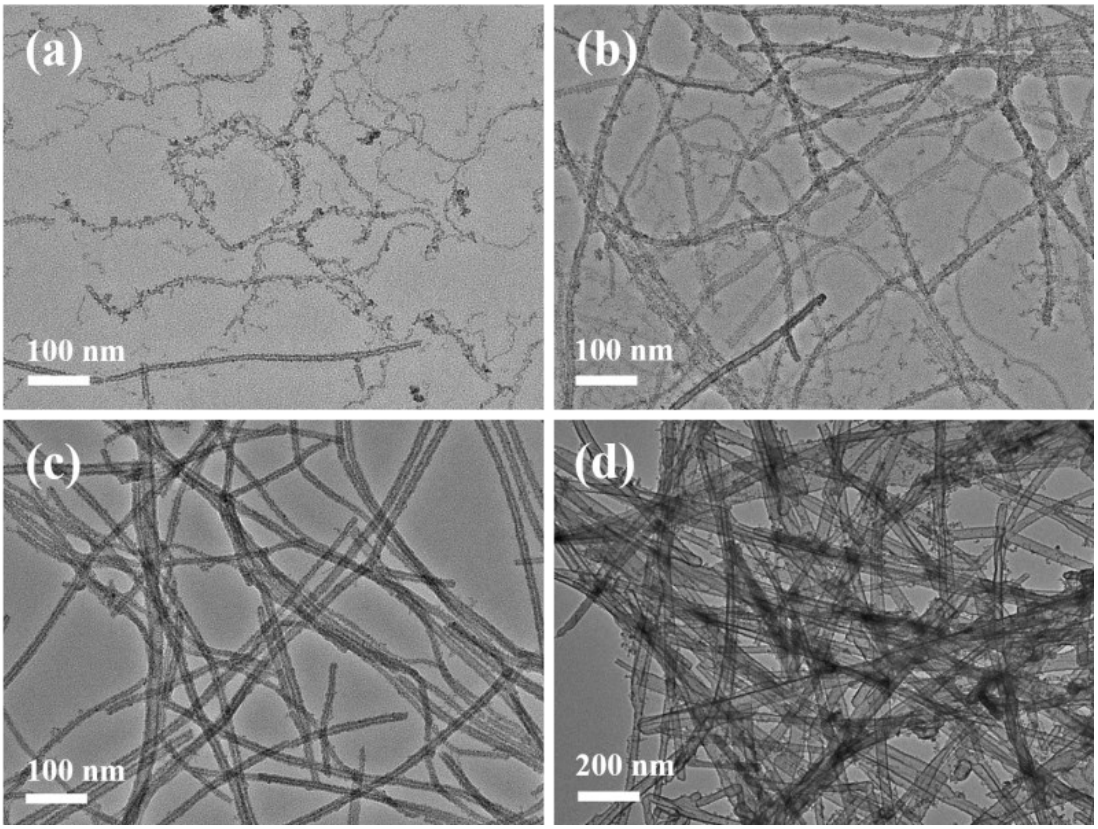


Fig. S5 TEM images of (a) $Ru_{0.07}Te$ NWs, (b) $Ru_{0.17}Te$ NTs, (c) $Ru_{0.28}Te$ NTs and (d) $Ru_{0.62}Te$ NTs.

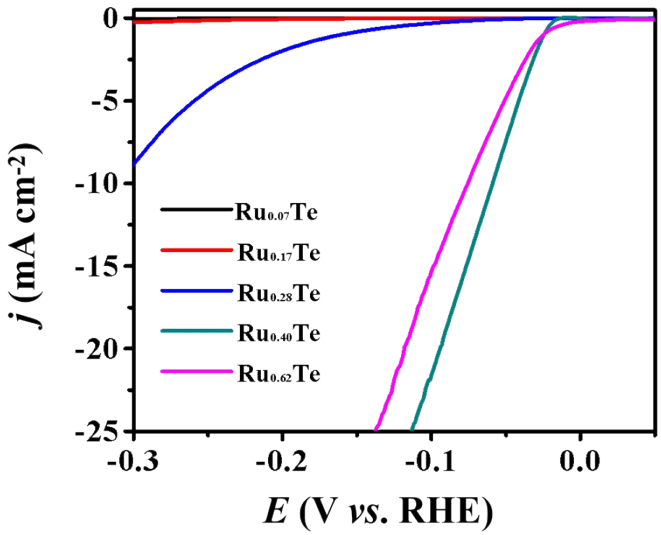


Fig. S6 LSV curves (with iR correction) for various electrodes collected in 1M KOH.

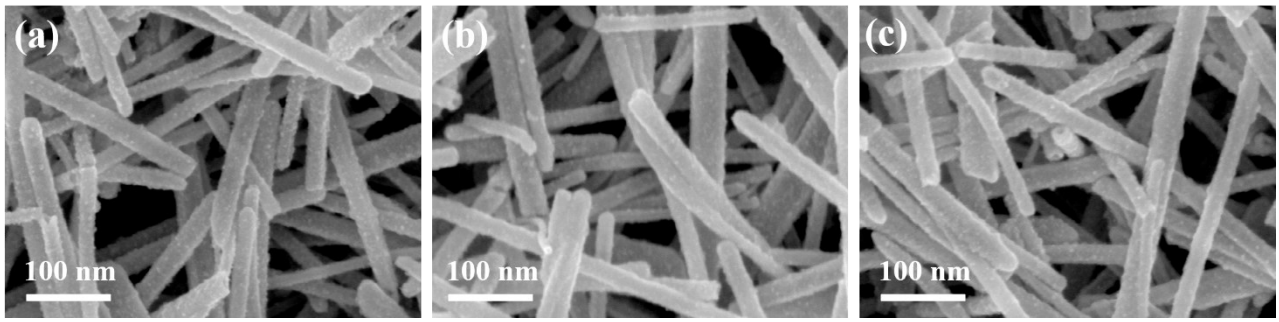
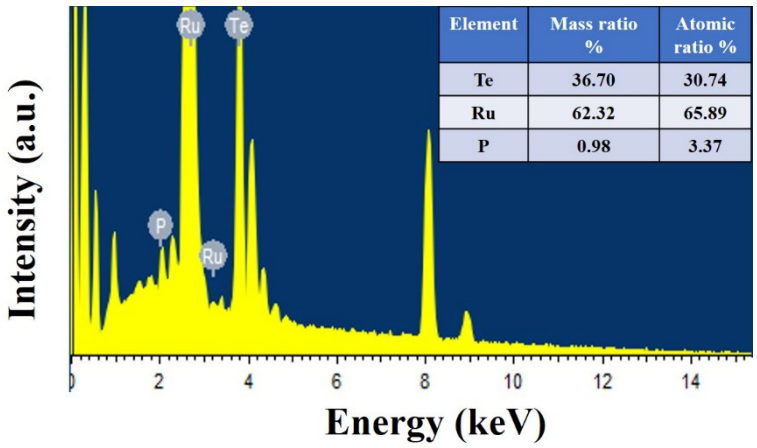


Fig. S7 SEM images of RuTeP samples prepared with different amounts of TOP under the typical synthesis: (a) 0.5 mL, (b) 1.0 mL and (c) 2.0 mL.



Element	Mass ratio %	Atomic ratio %
Te	36.70	30.74
Ru	62.32	65.89
P	0.98	3.37

Fig. S8 EDX spectrum of the typical RuTeP NTs.

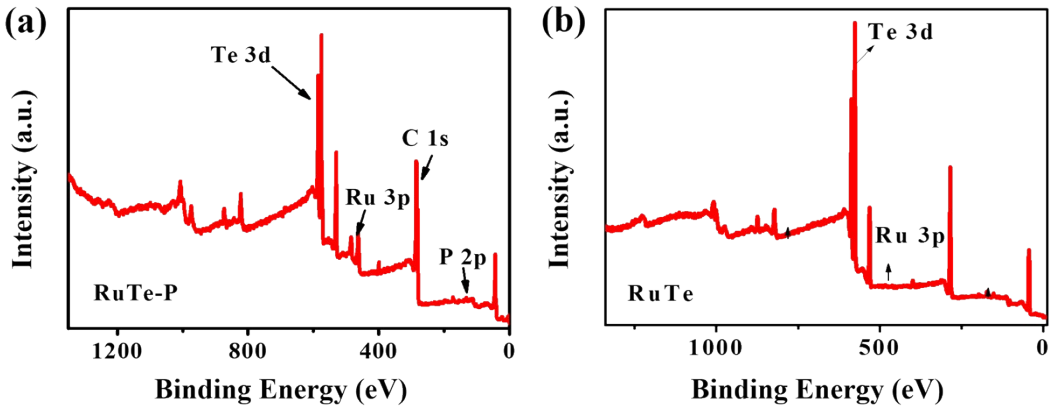


Fig. S9 The XPS survey spectra of the RuTeP NTs (a) and RuTe NTs (b).

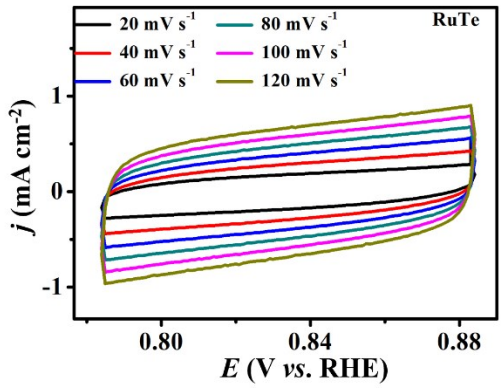


Fig. S10 Typical cyclic voltammogram (CV) curves of RuTe NTs with different scan rates.

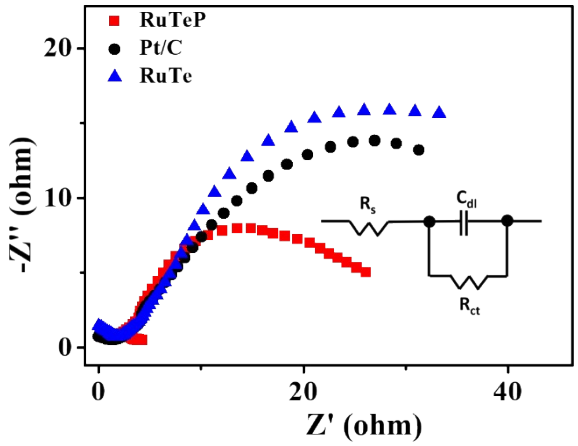


Fig. S11 Electrochemical impedance spectra of various catalysts in 1.0 M KOH under applied potentials of -0.035 V (vs. RHE).

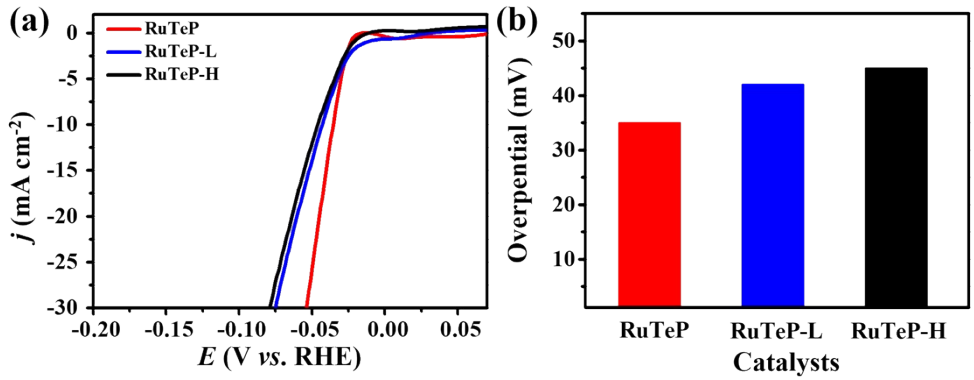


Fig. S12 (a) HER polarization curves of different phosphorous content catalysts in 1.0 M KOH. (b) Comparison of the overpotentials at -10 mA cm^{-2}.

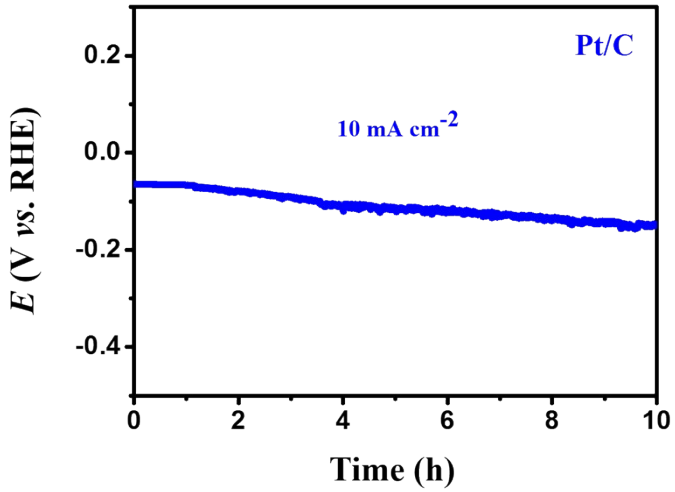


Fig. S13 The chronopotentimetric curve of Pt/C catalyst with constant cathode-current density of 10 mA cm^{-2} for10 h.

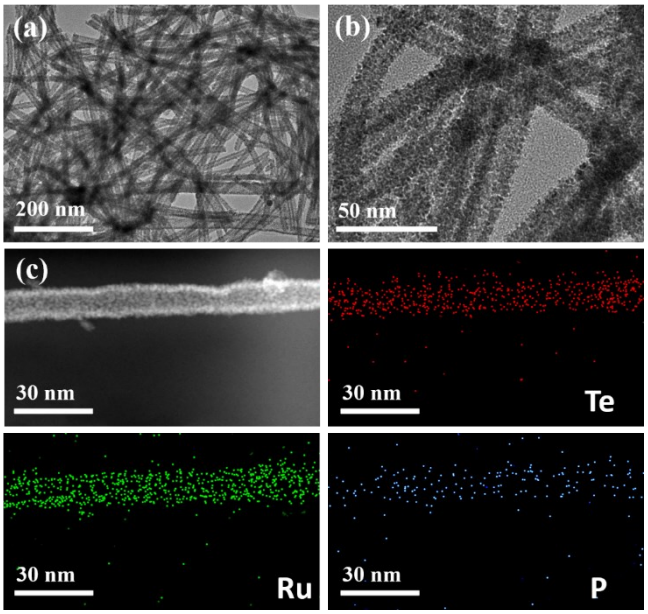


Fig. S14 (a, b) TEM and (c) HAADF-STEM and elemental mapping images of the RuTeP NTs after catalytic stability testing.

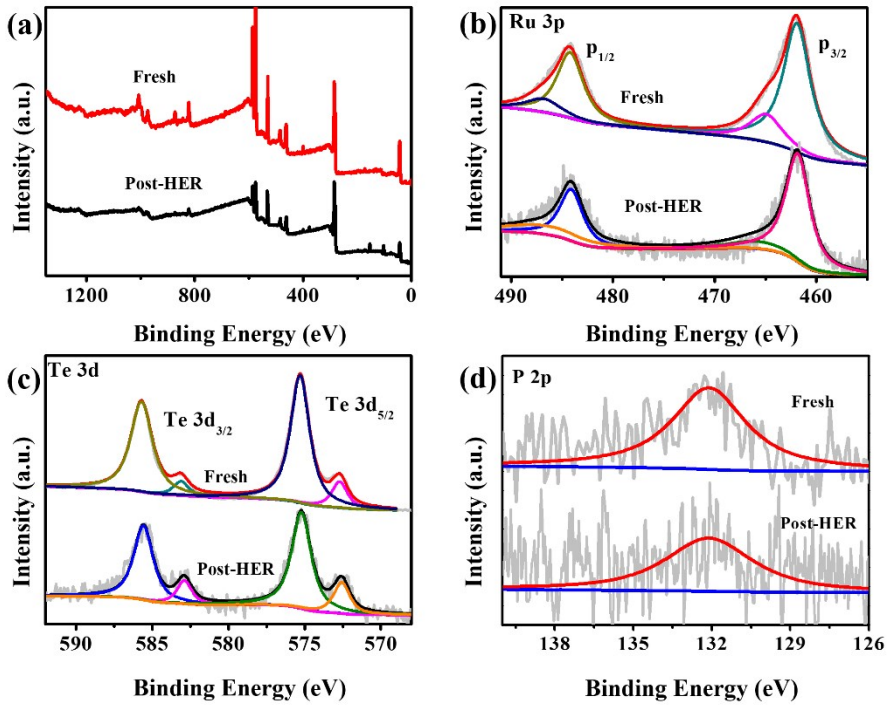


Fig. S15 (a) The XPS survey spectrum of the RuTeP NTs before and after catalytic stability testing. (b-d) XPS spectra of the Ru 3p, Te 3d and P 2p for the RuTeP NTs before and after catalytic stability testing.

Table S1. Mass ratio and atomic ratio of different elements in various RuTe samples by EDX analysis.

Catalysts	Element	Mass ratio %	Atomic ratio %
$Ru_{0.07}Te$	Ru	5.99	7.44
	Te	94.01	92.56
$Ru_{0.17}Te$	Ru	14.10	17.16
	Te	85.90	82.84
$Ru_{0.28}Te$	Ru	23.82	28.31
	Te	76.18	71.69
$Ru_{0.40}Te$	Ru	34.79	40.24
	Te	65.21	59.76
$Ru_{0.62}Te$	Ru	56.86	62.46
	Te	43.14	37.54

Table S2. Atomic ratio of different elements in various RuTeP samples by EDX analysis.

Catalysts	Adding TOP amount	Atomic ratio %
RuTeP-L	0.5 mL	Ru 66.78% : Te 31.35% : P 1.87%
RuTeP	1 mL	Ru 65.89% : Te 30.74% : P 3.37%
RuTeP-H	2 mL	Ru 61.15% : Te 33.95% : P 4.90%

Table S3. Comparison of HER activity for RuTeP NTs and some other reported Ru-based electrocatalysts in 1 M KOH electrolyte.

Catalysts	Electrode substrates	η_{10} (mV)	Tafel slope ($mVdec^{-1}$)	References
RuTeP	**GCE[a]**	**35**	**30.8**	**This work**
Ru-Ru_2P@PC	GCE	43.4	35.1	1
Ru/C_3N_4/C	GC-RDE[b]	79	/	2
RuP_2/NPC	GCE	52	69	3
Ru/CN	GCE	50	/	4
Ru_2P/PNC@CC	Graphite plate	50	52	5
Ru_2P	GCE	54	29	6
Ru_xP/NPC	GCE	154	114	7
Ru-NGC	GCE	around 50	40	8
Ni@Ni_2P–Ru HNRs	GCE	51	35	9
RuP/NPC	GCE	74	70	10

[a]Glassy carbon electrode; [b]Glassy carbon rotating disk electrode.

Reference

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