Electronic Supplementary Material (ESI) for Materials Chemistry Frontiers.

Supporting Information for

Defects tailoring IrO_2@TiN_{1+x} nano-heterojunction for superior water oxidation activity and stability

Sen Wang,[a] Hong Lv,, [a] Songhu Bi,[a] Tianqi Li,[a] Yongwen Sun,[a] Wenxuan Ji,[a] Cong Feng,[b] Cunman Zhang[a]*

[a] *Institute of Fuel Cell Composite Power Sources, Clean Energy Automotive Engineering Center, School of Automotive Studies, Tongji University, Shanghai 201804, P. R. China.*

[b] *School of Materials Science and Engineering, Tongji University, Shanghai, 201804, P. R. China.*

**Corresponding Authors*

Email: lvhong@tongji.edu.cn. (Hong Lv)

Telephone Number: +86(21) 69583850

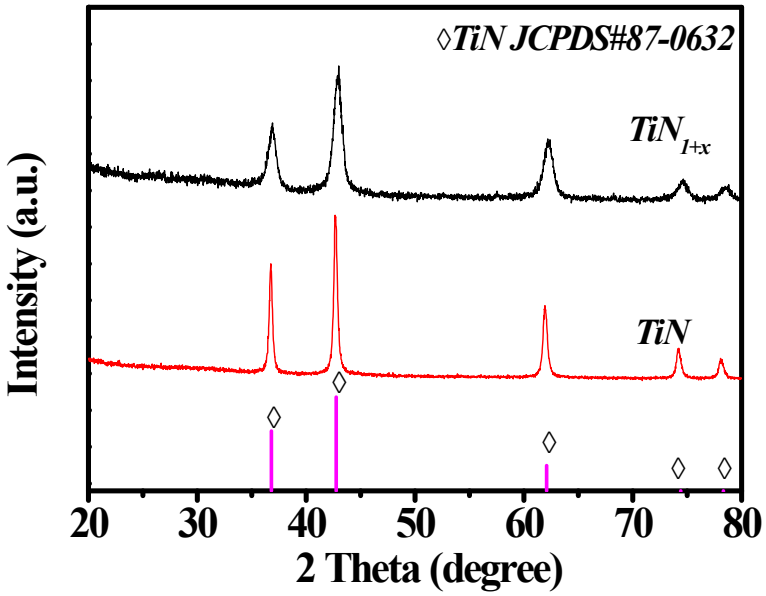

Fig. S1 (a) XRD patterns of TiN and TiN_{1+x}.

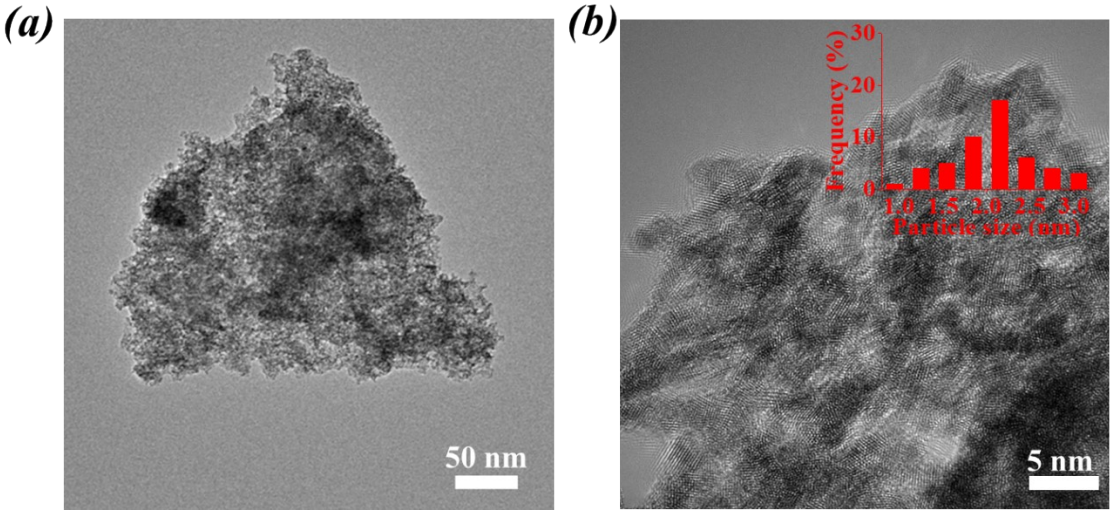

Fig. S2 (a) TEM and (b) HRTEM images of IrO_2.

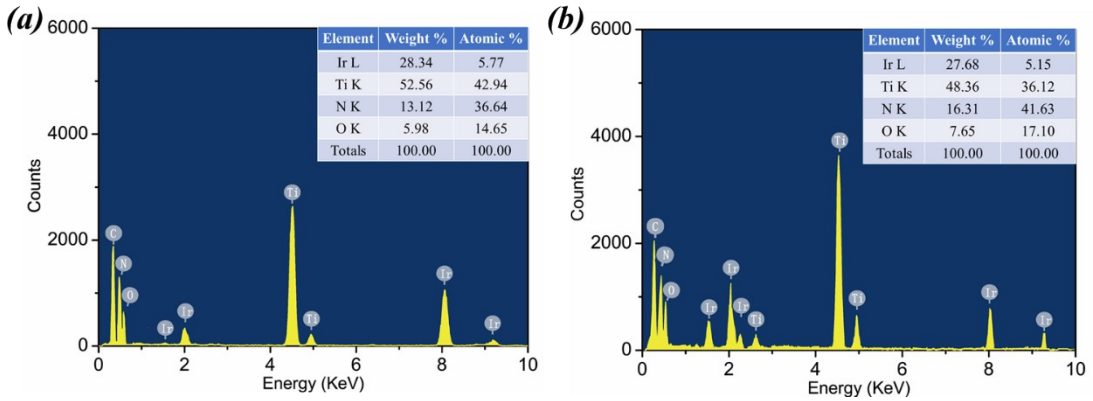

Fig. S3 EDS spectrum and the corresponding element contents of (a) IrO_2/TiN and (b) IrO_2/TiN_{1+x}.

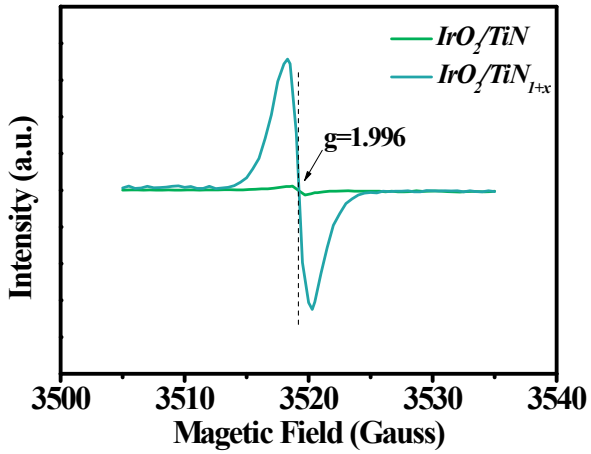

Fig. S4 EPR spectra of IrO_2/TiN and IrO_2/TiN_{1+x}.

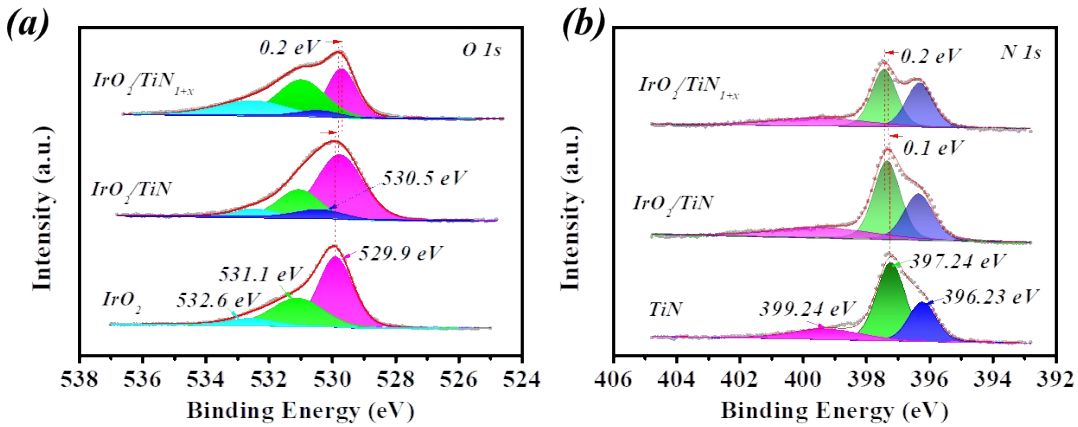

Fig. S5 High-resolution of (a) Ir 4f, (b) Ti 1 s, (c) O1s and (d) N 1 s XPS spectra.

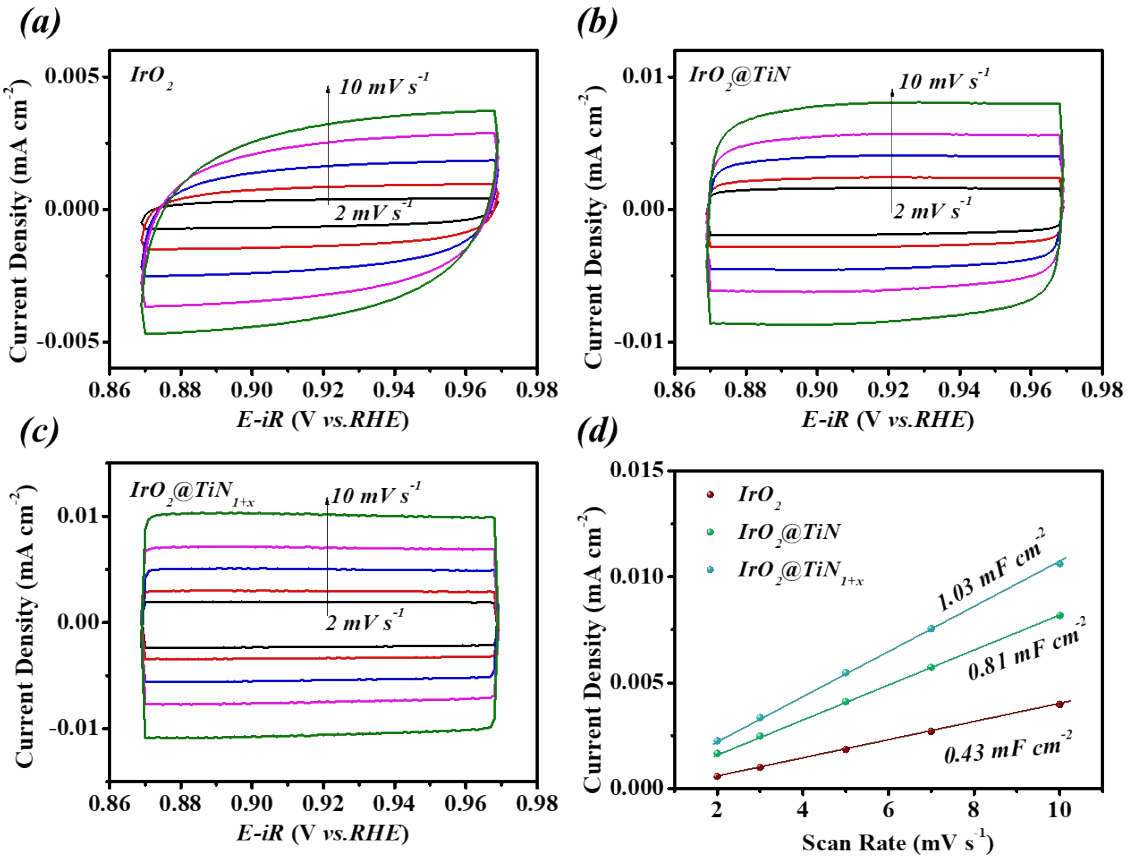

Fig. S6 CV curves of (a) IrO_2, (b) IrO_2@TiN, and (c) IrO_2@TiN_{1+x} measured within the range of 0.87–0.97 V vs. RHE, (d) corresponding plots of the current densities at 0.919 V vs. RHE with the different scan rates.

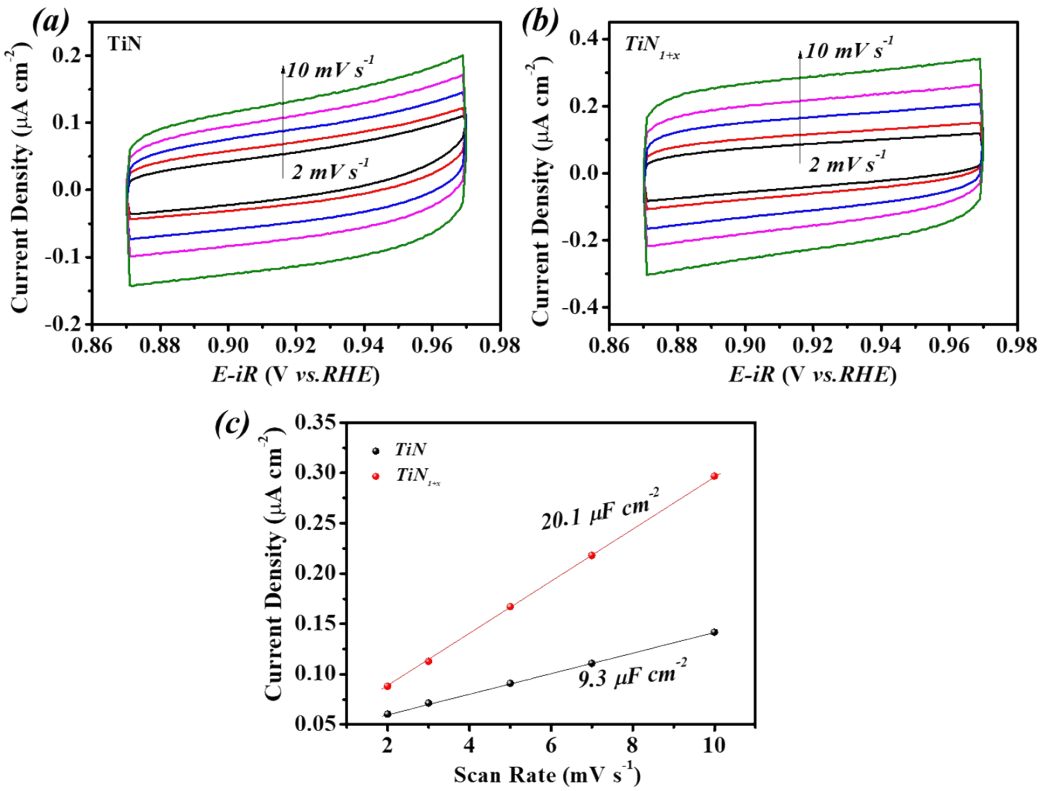

Fig. S7 CV curves of (a) TiN, (b) TiN_{1+x} measured within the range of 0.87–0.97 V vs. RHE, (d) corresponding plots of the current densities at 0.919 V vs. RHE with the different scan rates.

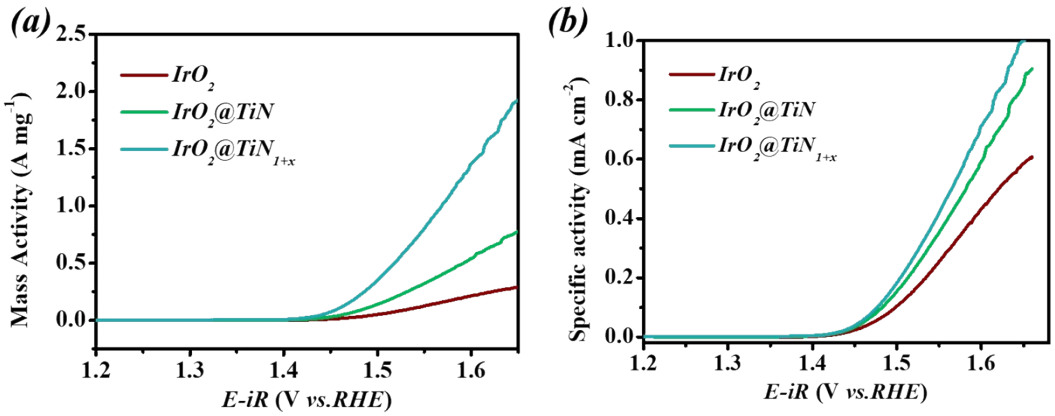

Fig. S8 (a) Mass activity and (b) specific activity of the prepared samples.

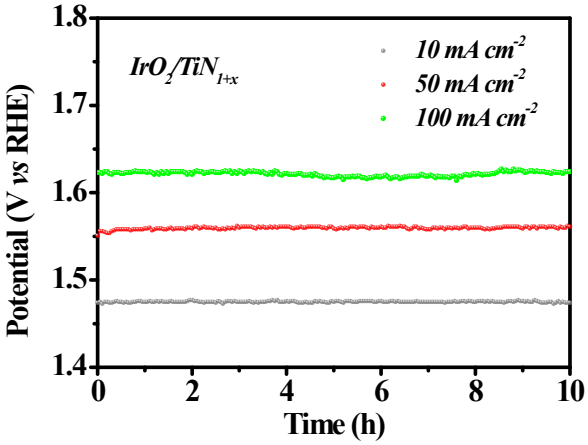

Fig. S9 IrO_2@TiN_{1+x} at the current densities of 10, 50, 100 mA cm^{-2} for 10 h.

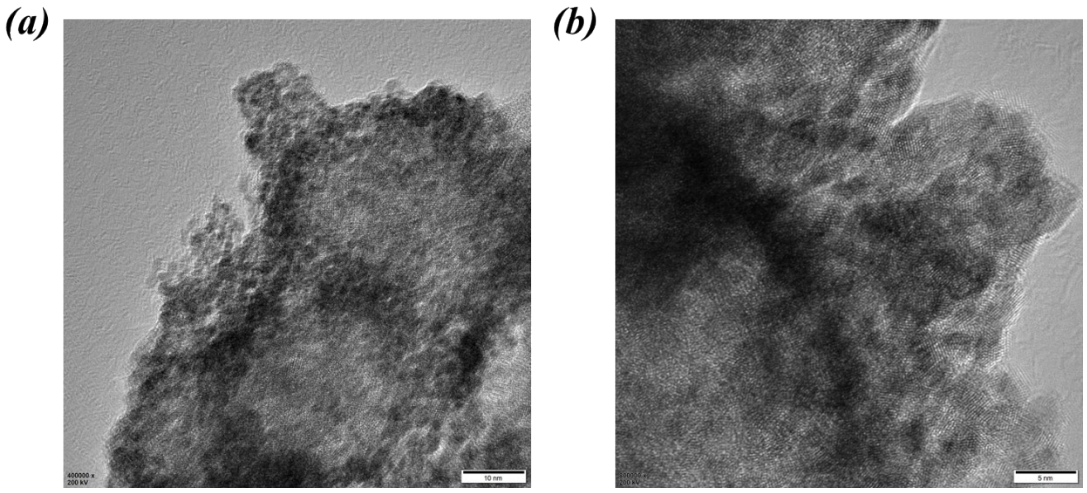

Fig. S10 (a) TEM and (b) HRTEM of IrO_2@TiN_{1+x} after 100 h stability test.

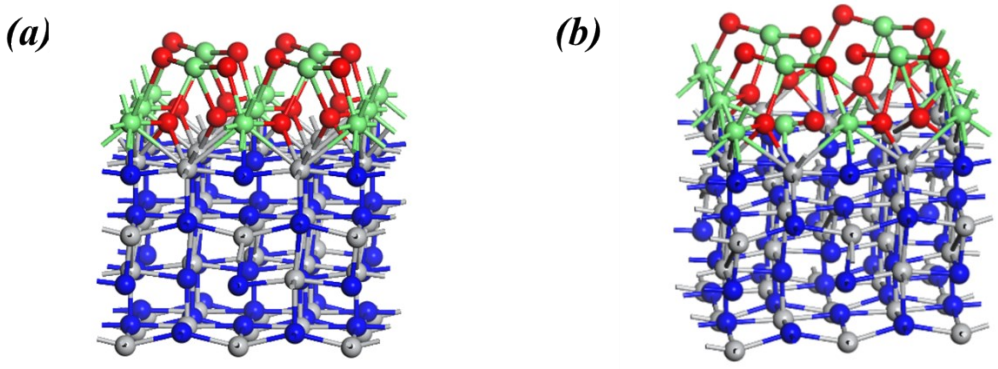

Fig. S11 The optimized models of (a) IrO_2@TiN and (b) IrO_2@TiN_{1+x}.