Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Dendritic Growth of Monolayer Ternary $WS_{2(1-x)}Se_{2x}$ Flakes for Enhanced Hydrogen Evolution Reaction

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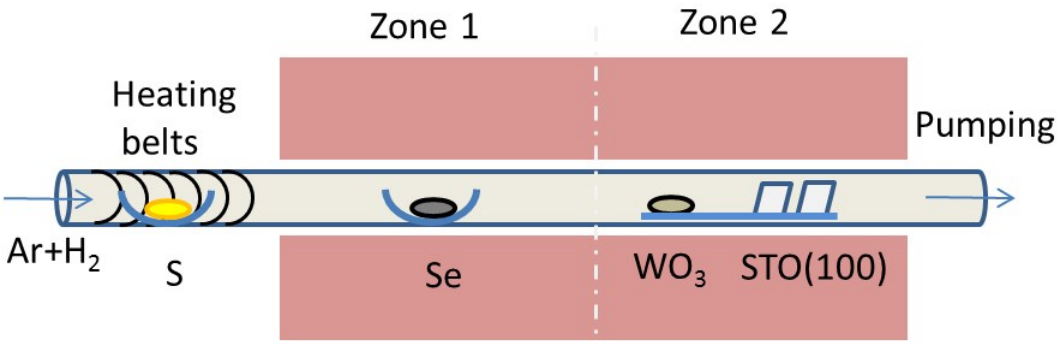

Fig. S1 Schematic view of the utilized LPCVD system and the experimental setup for the synthesis of dendritic $WS_{2(1-x)}Se_{2x}$ on STO(100) substrates.

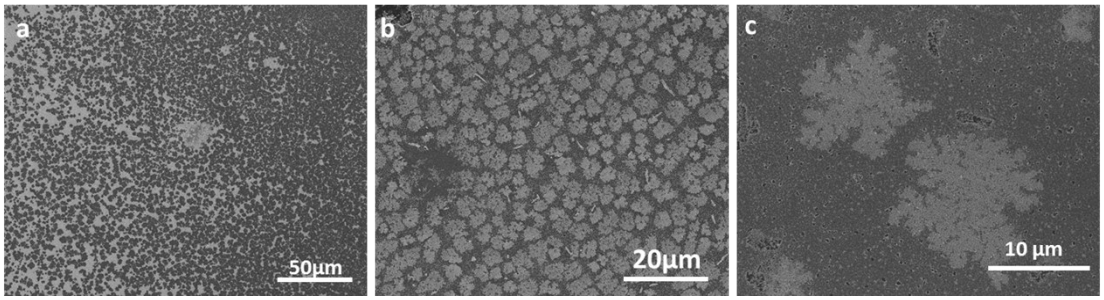

Fig. S2 SEM morphologies of LPCVD synthesized dendritic $WS_{2(1-x)}Se_{2x}$ on STO (100). (a) Large scale SEM image of dendritic $WS_{2(1-x)}Se_{2x}$ on STO (100). (b) SEM image of a small region from a. (c) SEM image of small region from c.

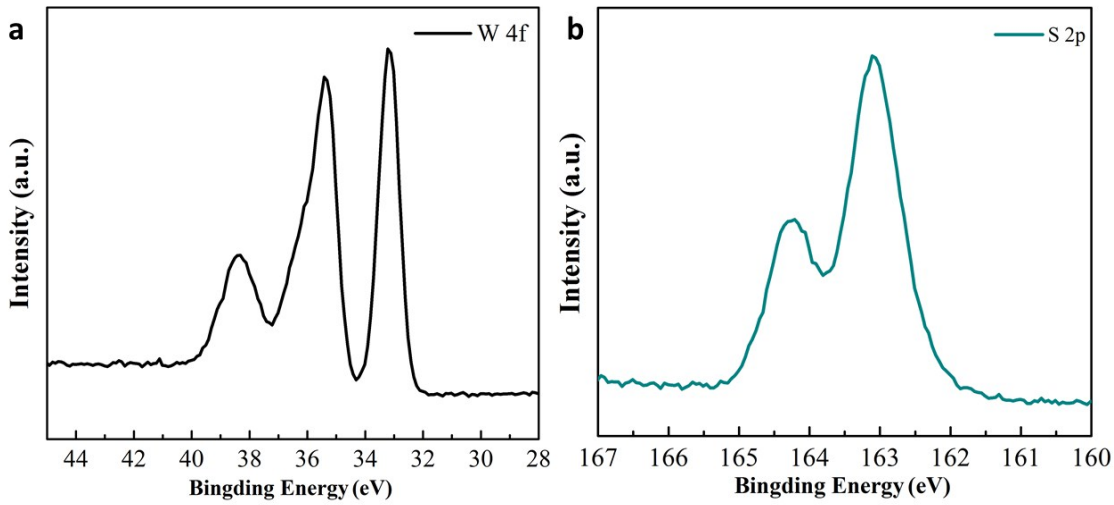

Fig. S3 X-ray photoemission spectroscopy (XPS) data of WS_2 on STO(100). (a) High resolution XPS spectra of W 4f region. Two stronger peaks at binding energies of 33.2eV and 35.3eV correspond to the W $4f_{7/2}$ and W $4f_{5/2}$ states, respectively. The peak at around 38.4eV represents the W $5p_{7/2}$ state, accounting for the existence of WO_3 species due to slight surface oxidation. (b) High resolution XPS spectra of S 2p region. S $2p_{3/2}$ and S $2p_{1/2}$ states are at binding energies of 163.0 eV and 164.2 eV respectively.

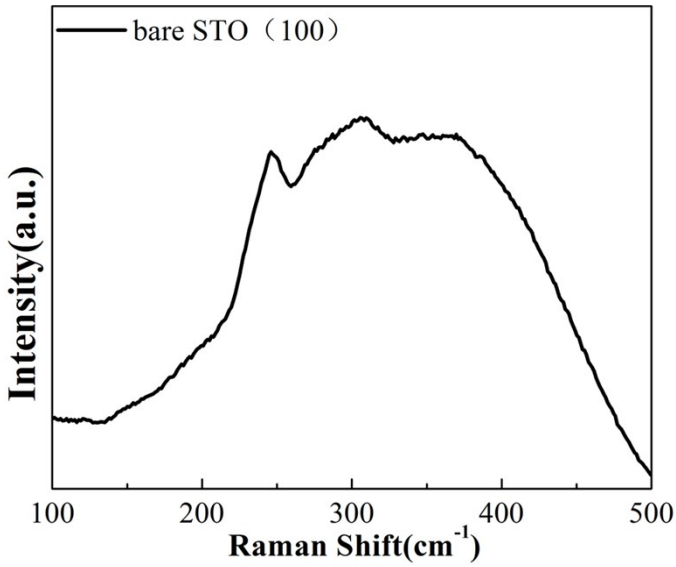

Fig. S4 Raman spectra of the bare STO(100). Bare STO(100) has strong Raman signals from 200 to 500 cm^{-1}, which just covers the Raman signals of $WS_{2(1-x)}Se_{2x}$.

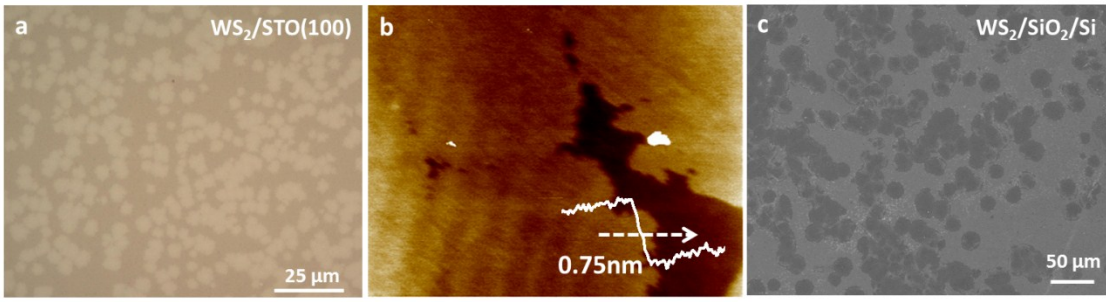

Fig. S5 The synthesis of monolayer dendritic WS_2 on STO(100). (a) Optical image of monolayer dendritic WS_2 on STO(100). (b) Corresponding AFM image of as-grown dendritic WS_2 on STO (001), and the inset section view along the white arrows revealing a monolayer thickness of ~0.75nm

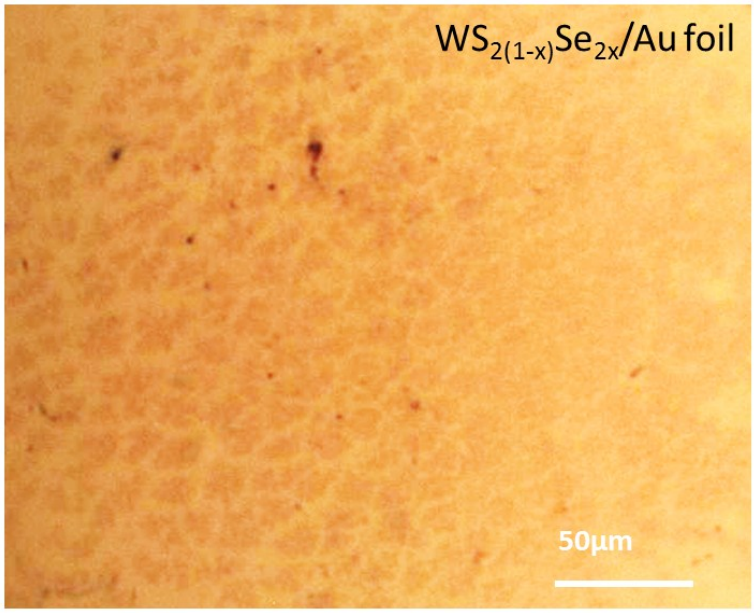

Fig. S6 The optical image of transferred monolayer dendritic $WS_{2(1-x)}Se_{2x}$ on Au foil.

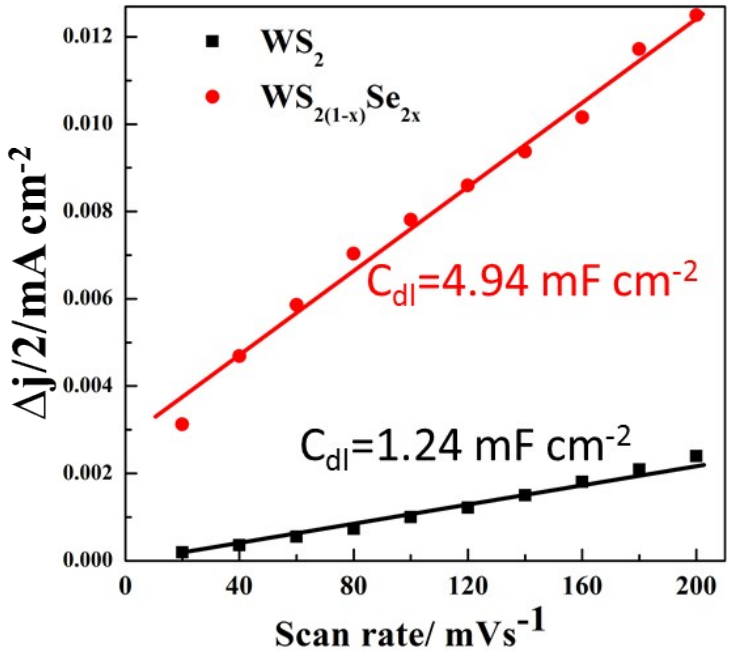

Fig. S7 Liner fitting of the capacitive currents of the catalysts ($WS_{2(1-x)}Se_{2x}$ and WS_2) *vs* scan rate, confirming the reserved high electrochemically active surface area of dendritic $WS_{2(1-x)}Se_{2x}$ flakes.