Supporting Information

Strained $W(Se_xS_{1-x})_2$ Nanoporous Films for High Efficient Hydrogen Evolution

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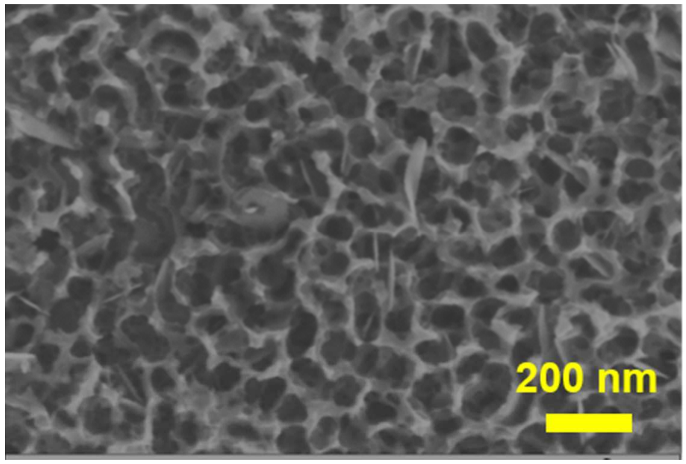

Figure S1. Top-view SEM image of the anodized porous WO_3.

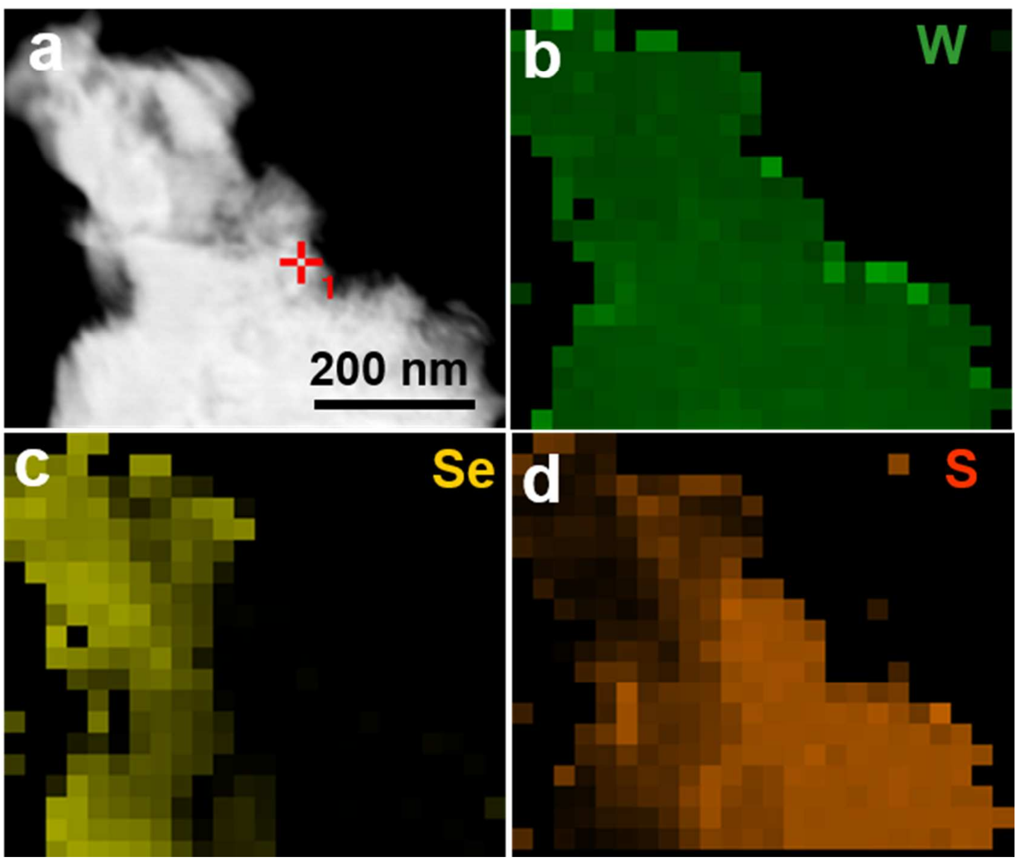

Figure S2. (a) TEM image and (b-d) corresponding elemental mapping of the strained $W(Se_xS_{1-x})_2$.

Residual stress estimation

X-ray diffraction (XRD) technique for residual stress measurement is usually associated to the $\sin^2\Psi$ method, which is based on the interception of the diffraction cone and line detectors. The peak 2θ values are obtained at various Ψ angles. From the slope of $\sin^2\Psi$ *vs* 2θ curves, the residual stress can be estimated using the following equation (S-1):

$$\sigma = \left(\frac{E}{1+\nu}\right)\frac{1}{d_0}\left(\frac{\partial d_\psi}{\partial sin^2\Psi}\right) \qquad \text{(S-1)}$$

where E and v denote the Young's modulus and Poisson's ratio.[1-3]

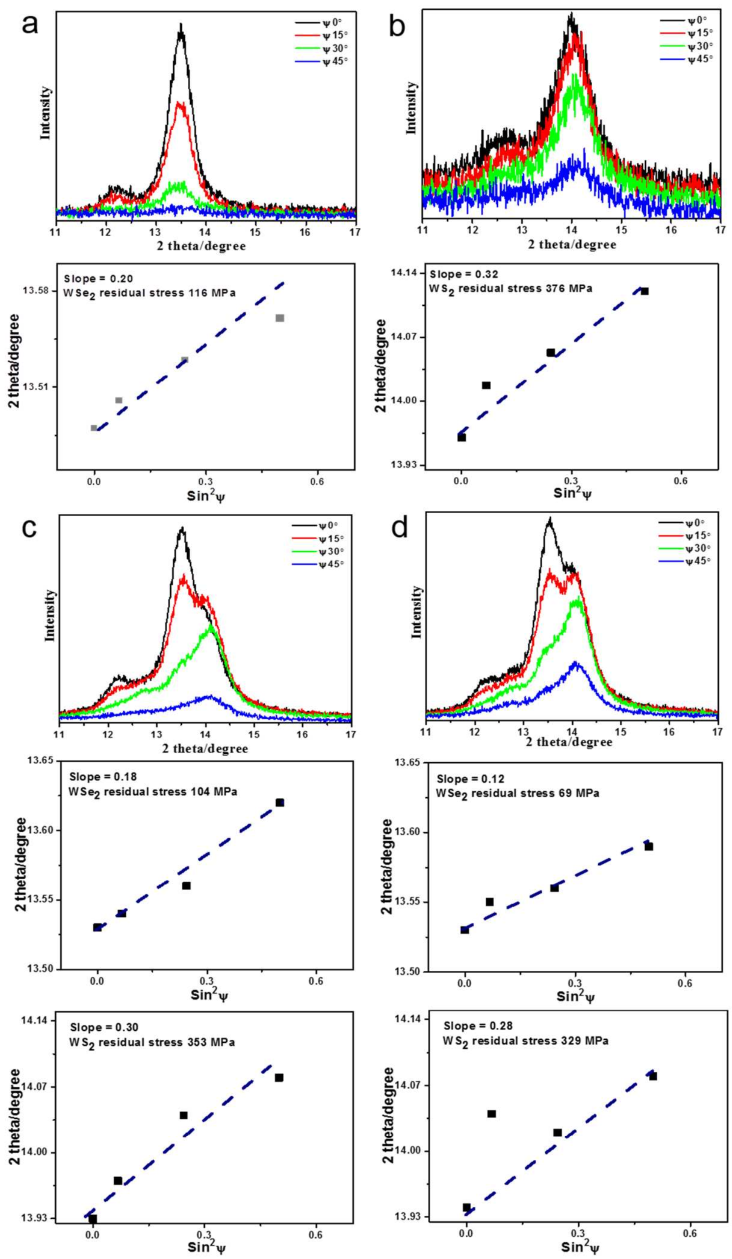

Figure S3. Residual stress estimated by XRD $\sin^2\Psi$ method.

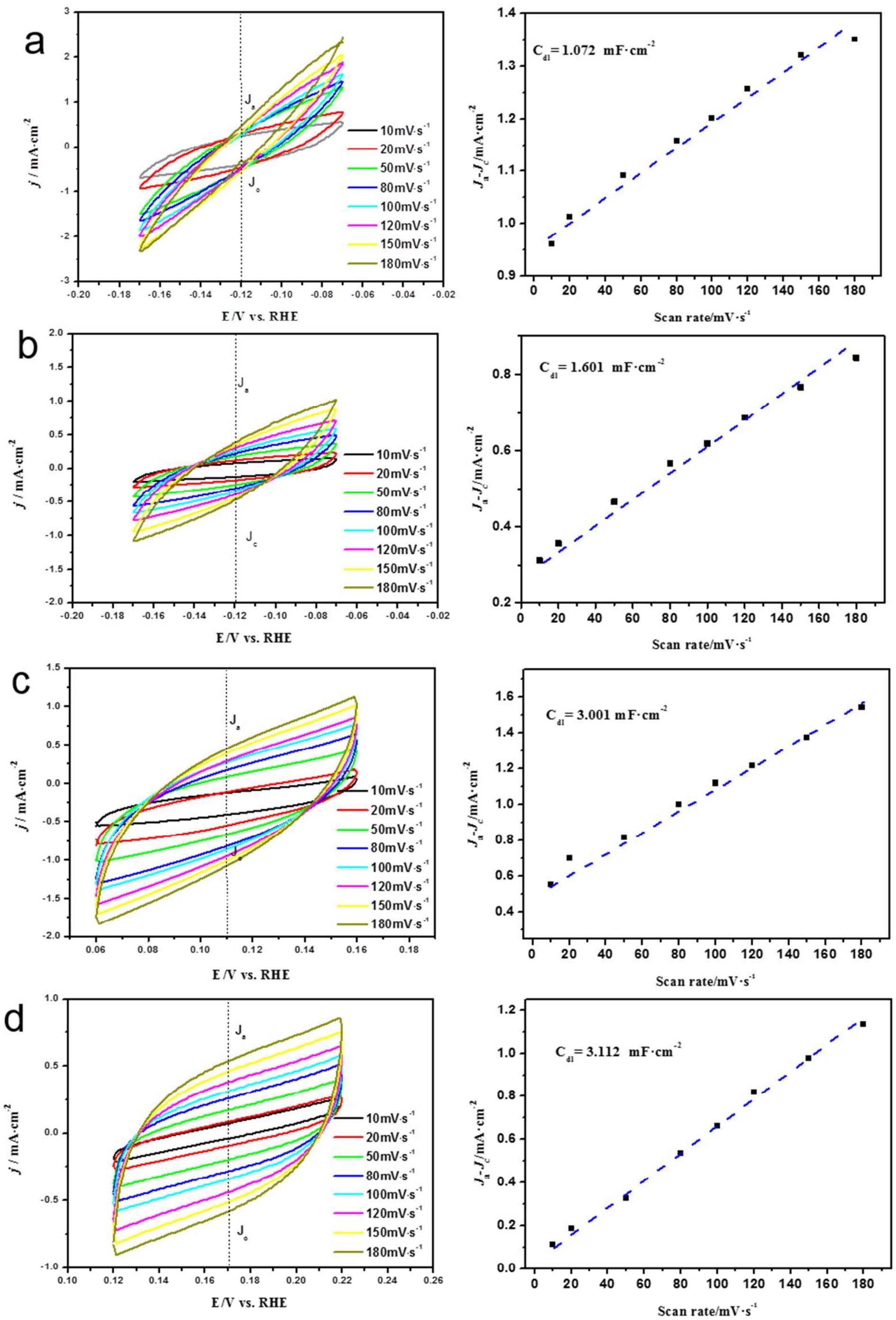

Figure S4. Electrochemical active surface area of the strained films. (a-d) CV curves and corresponding capacitances of WS_2, WSe_2 $W(Se_xS_{1-x})_2$-15 and $W(Se_xS_{1-x})_2$-30, respectively.

Table S1. Comparison with other HER catalysts (in 0.5 M H_2SO_4).

Catalysts	Tafel slope (mV decade^{-1})	η at 10 mA cm^{-2} (mV)	η_{onset} (mV)	Reference
Strained $W(Se_xS_{1-x})_2$	59	110	45	This work
$W(Se_xS_{1-x})_2$ nanoflake	98	158	80	4
WS_2@graphene film	52.7	125	---	5
WSe_2/graphene sheets	64	---	100	6
Monolayer $WS_{2(1-x)}Se_{2x}$	60	---	80	7
WS_2 nanoribbon	68	313	150	8
$WS_{2(1-x)}Se_{2x}$ nanotube	105	---	---	9
$WS_{2(1-x)}Se_{2x}$ nanoribbon	68	170	---	10

Reference

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