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Supporting Information

$CoS_{2x}Se_{2(1-x)}$ Nanowire Array: An Efficient Ternary Electrocatalyst for Hydrogen Evolution Reaction

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Synthesis of CoS_2 NWs

The CFs, onto which CoO NWs grew, was placed at the downstream side of the tube furnace and 0.5 g S powder was placed at the upstream side (the distance of CF and S powder is 22 cm). To create an oxygen-free environment, the tube furnace was flushed three times under a 100 sccm Ar flow. After flushed with Ar, the tempratures of the CoO NWs zone and S powder zone were quickly rasied to 450 °C and 125 °C respectively in 20 min and lasted for 90 min. During the whole process, the flow of Ar was kept at a rate of 100 sccm.

Synthesis of $CoSe_2$ NWs

The CFs, onto which CoO NWs grew, was placed at the downstream side of the tube furnace and 0.5 g Se powder was placed at the upstream side (the distance of CF and Se powder is 22 cm). To create an oxygen-free environment, the tube furnace was flushed three times under a 100 sccm Ar flow. After flushed with Ar, the tempratures of the CoO NWs zone and Se powder zone were quickly rasied to 450 °C and 300 °C respectively in 20 min and lasted for 90 min. During the whole process, the flow of Ar was kept at a rate of 100 sccm.

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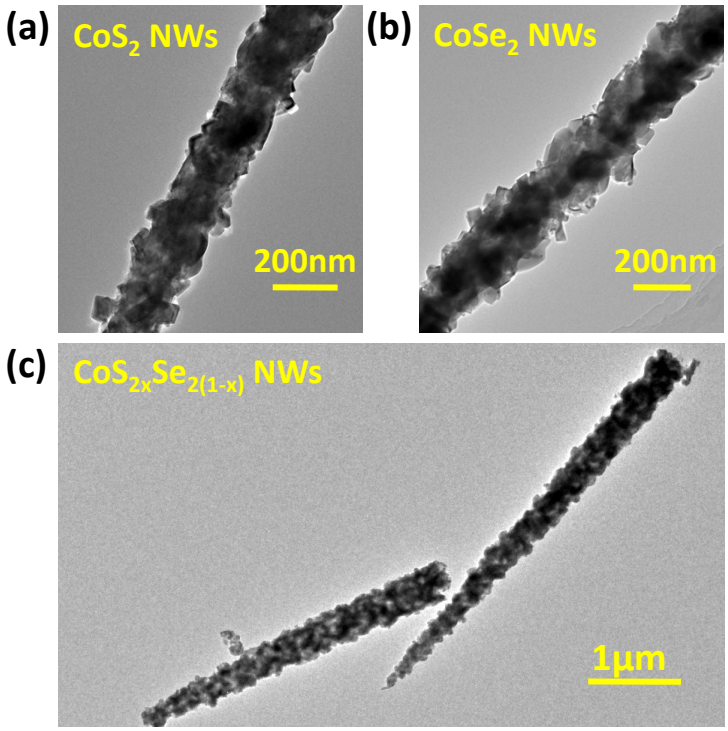
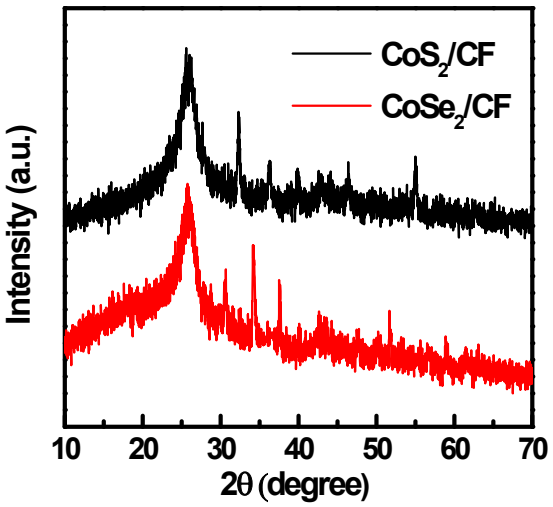


Fig. S1. TEM image of CoS_2 NWs (a), $CoSe_2$ NWs (b) and $CoS_{2x}Se_{2(1-x)}$ NWs (c).

Fig. S2. XRD patterns of CoS_2 NWs and $CoSe_2$ NWs.



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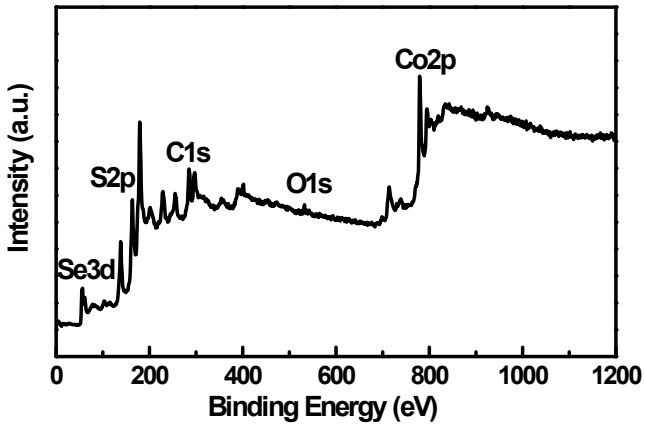

Fig. S3 XPS spectra of $CoS_{2x}Se_{2(1-x)}$ NWs/CF.

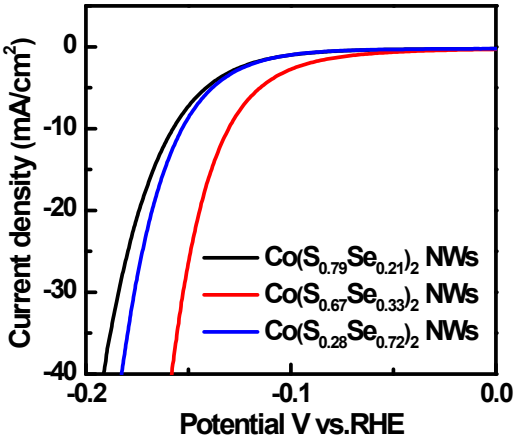

Fig. S4. Polarization curves of different tenary samples with various elemental components.

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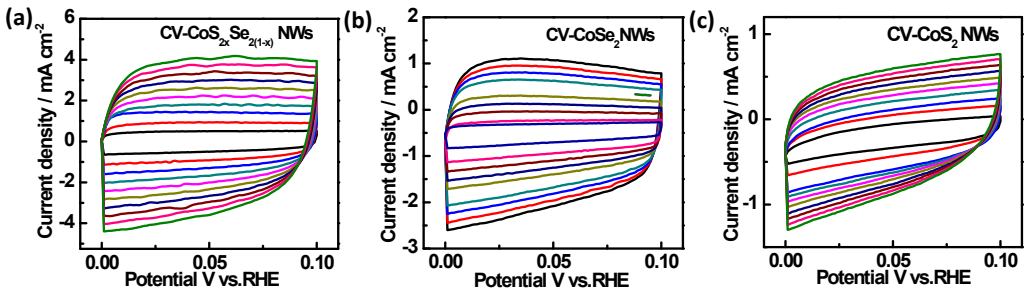

Fig. S5. Cyclic voltammograms (CV) curves of different catalysts: $CoS_{2x}Se_{2(1-x)}$ NWs (a), $CoSe_2$ NWs (b) and CoS_2 NWs (c) at scan rates of 20mv/s-200 mv/s.

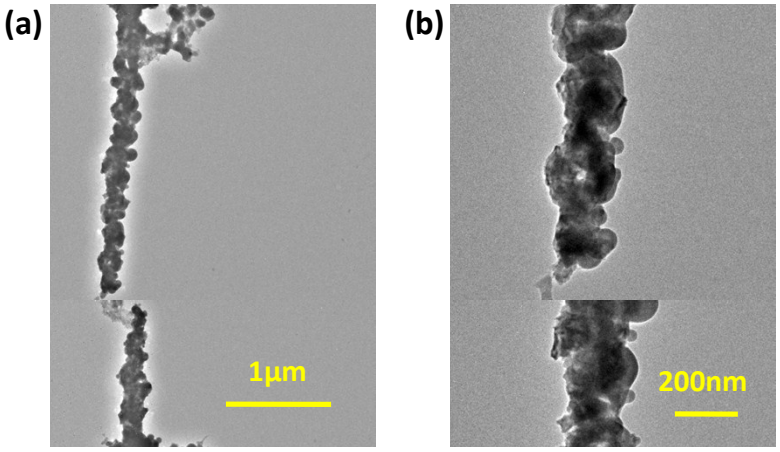

Fig. S6. Low magnificent (a) and high magnificent (b) TEM images of $CoS_{2x}Se_{2(1-x)}$ NWs after 1000 potential cycles.