2D MOF-derived ultra-thin CoSe$_2$-NiSe$_2$/CN: Dual-phase synergistic effect and abundant defects to enhance the hydrogen evolution reaction

Weifeng Jiang$^a$, Jianpeng Sun$^b$, Zhaodi Huang$^b$, Chuanhai Jiang$^a$, Huakai Xv$^a$, Kebin Lu$^b$, Ning Cao$^a$* and Fangna Dai$^a$*.

$^a$ School of Materials Science and Engineering, China University of Petroleum (East China), Qingdao, Shandong, 266580, PR China.

$^b$ College of Science, China University of Petroleum (East China), Qingdao, Shandong, 266580, PR China.

*Corresponding Author: fndai@upc.edu.cn; caoning@upc.edu.cn.
Figure S1 The framework structure of 2D CP (Co[Ni(CN)$_4$]).
Figure S2 FT-IR spectra of (a) 2D CP Precursor, (b) Co-NiSe$_2$/CN and (c)CoSe$_2$-NiSe$_2$/CN.
Figure S3 (a) Thermogravimetric analysis (TGA) curves of CoSe$_2$-NiSe$_2$/CN measured under an O$_2$ atmosphere.
Figure S4 XRD pattern of (a) CoSe\textsubscript{2} and (b) NiSe\textsubscript{2}.
Figure S5 N$_2$ adsorption-desorption isotherms of (a) 2D CP Precursor, (b) Co-NiSe$_2$/CN, (c) CoSe$_2$ and (d) NiSe$_2$. 
Figure S6 AFM image and the corresponding height profiles of 2D CP Precursor (a) and Co-NiSe$_2$/CN (d).
Figure S7 The Raman spectra of Co-NiSe$_2$/CN and CoSe$_2$-NiSe$_2$/CN.
Figure S8 EDS spectra of Co-NiSe$_2$/CN and CoSe$_2$-NiSe$_2$/CN.
Figure S9 XPS spectra of Co-NiSe$_2$/CN: (a) Full scan spectrum; (b) Ni 2p; (c) Co 2p; (d) Se 3d; (e) N 1s and (f) C 1s.
Figure S10 (a-c) CV curves of Co-NiSe₂/CN, CoSe₂ and NiSe₂ in 0.5 M H₂SO₄ respectively at different scan rates.
Figure S11 HRTEM image of CoSe$_2$-NiSe$_2$/CN after the electrochemical stability test.

References