Electronic Supporting Information

Strategic Cation Exchange Induced 2D Nickel Sulphide Nanoplates with Enhanced Oxygen Evolution Reaction Performance

Jiayi Chen,[a] Xiaomin Xu, [b] Rundong Mao, [a] Cuifang Wang,[b] Hsien-Yi Hsu,[c,d] Zongyou Yin,[e] Mark A. Buntine,[a] Alexandra Suvorova,[f] Martin Saunders,[f] Zongping Shao,[b] and Guohua Jia*[a]*

[a] School of Molecular and Life Sciences, Curtin University, Bentley, WA 6102, Australia. E-mail: guohua.jia@curtin.edu.au

[b] WA School of Mines: Minerals, Energy and Chemical Engineering (WASM-MECE), Curtin University, Perth, WA, 6102 Australia. E-mail: zongping.shao@curtin.edu.au

[c] School of Energy and Environment, City University of Hong Kong, Kowloon Tong, Hong Kong SAR, P. R. China

[d] Shenzhen Research Institute of City University of Hong Kong, Shenzhen, 518057, P. R. China

[e] Research School of Chemistry, Australian National University, Canberra, ACT 2600, Australia

[f.] Centre for Microscopy Characterization and Analysis (CMCA), The University of Western Australia, Perth, WA 6009, Australia

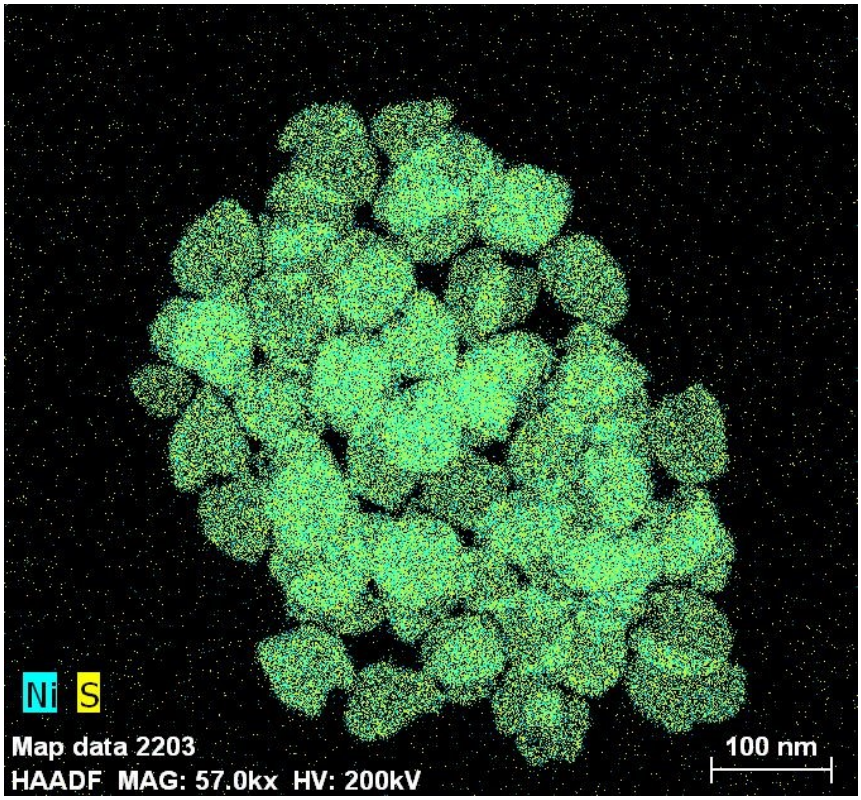

Fig. S1 (A) STEM-EDS elemental mapping of Ni and S overlay mapping result of Ni_xS nanoplates,

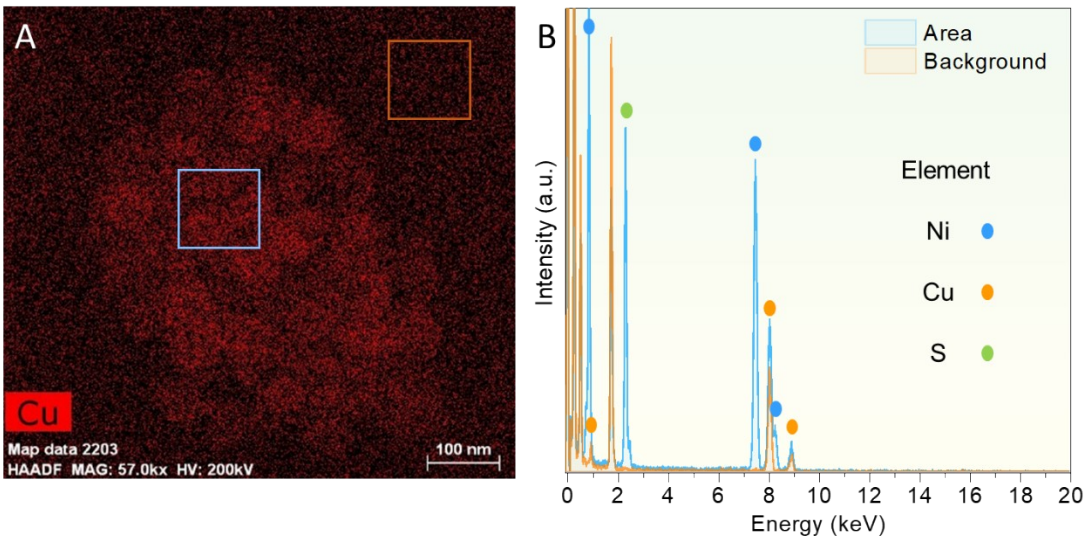

Fig. S2 (A) STEM-EDS elemental mapping of Cu of Ni_xS nanoplates, (B) EDS spectrum of sample area (in blue) and background area (in orange). Peaks of Ni, Cu and S are marked in blue, orange and green dots, respectively.

Formula	Ni (mg/kg)	Cu (mg/kg)	Ni at%	Cu at%
Ni_xS	610000	1500	0.997733925	0.002266075

Table S1 ICP-AES results of Ni and Cu contents and calculated Ni at% and Cu at% in Ni_xS nanoplates.

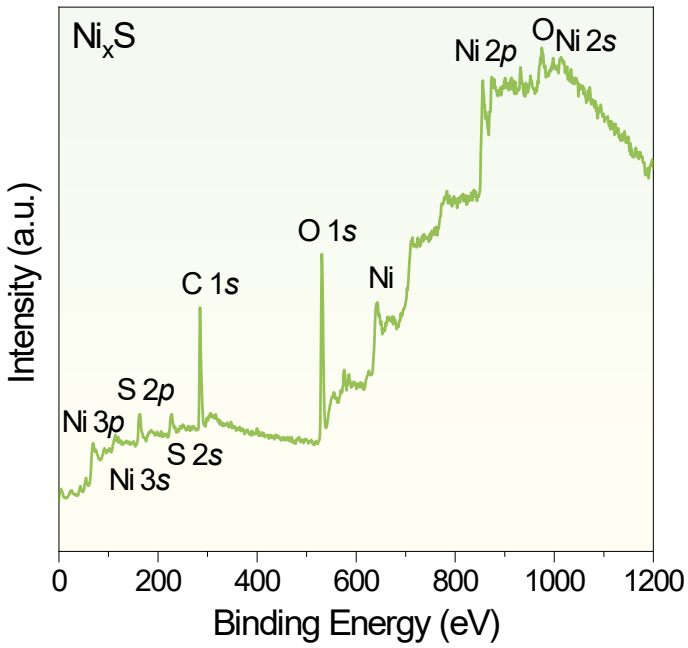

Fig. S3 XPS survey spectra of Ni_xS nanoplates.

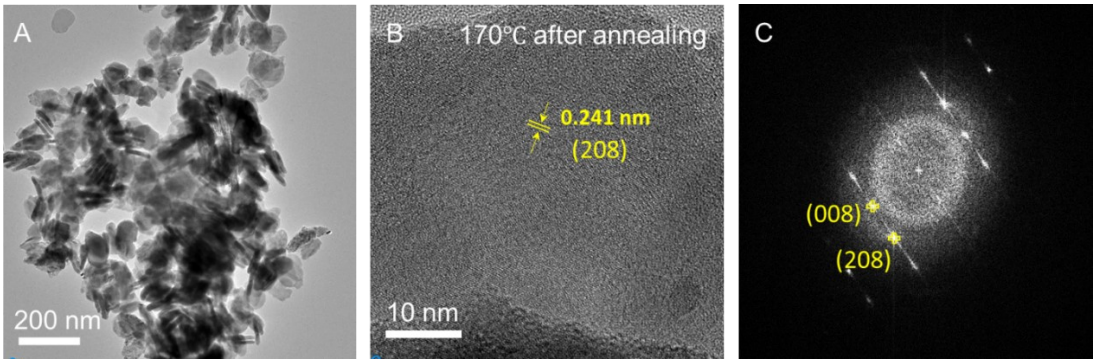

Fig. S4 (A) TEM, (B) HRTEM and (C) corresponding FFT pattern of calcined Ni_xS nanoplates.

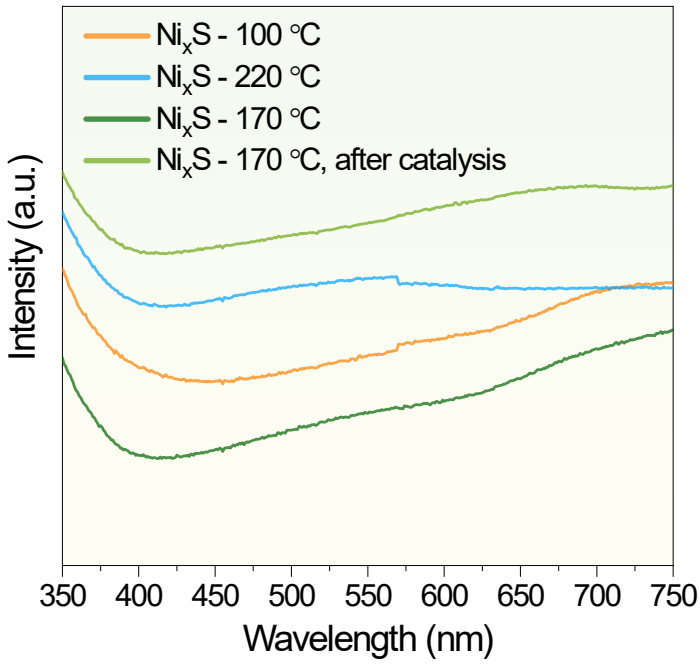

Fig. S5 UV-Vis spectra of annealed Ni_xS nanoplates synthesised at 100 ℃, 170 ℃ and 220 ℃, and Ni_xS nanoplates synthesised at 170 ℃ after electrochemical measurement.

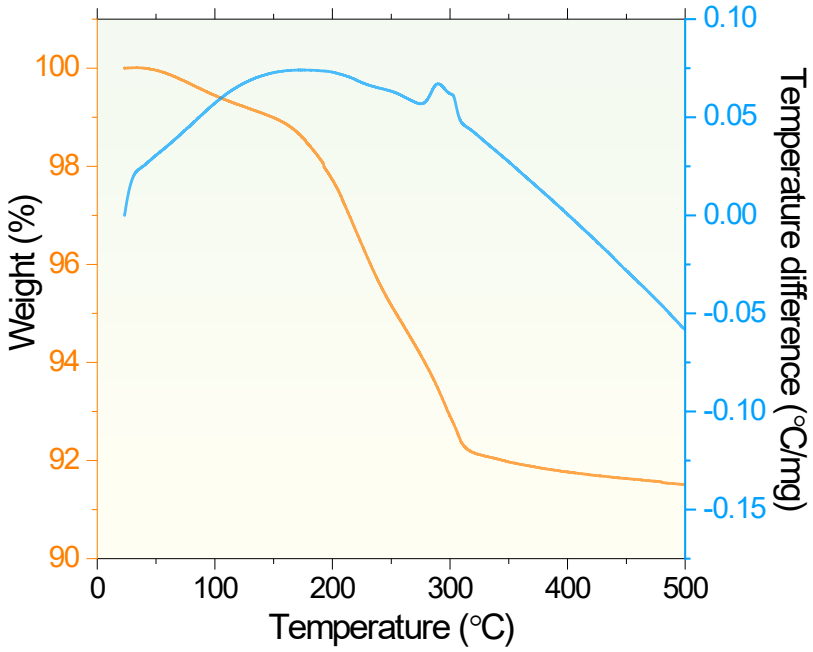

Fig. S6 Differential thermal analysis (DTA) and thermal gravimetric analysis (TGA) of Ni_xS nanoplates under nitrogen. The mass loss corresponds to the ligand detachment, and the remaining mass is the mass of the Ni_xS nanoplates.

8 mg of Ni_xS nanoplates synthesised at 170 °C was weighed into a 110 µL platinum crucible with a matched empty crucible as a reference. The sample was heated from ambient to 600 °C at 5 °C per minute in a nitrogen atmosphere flowing at 100 ml per minute. The temperature scale of the instrument was calibrated using the melting points of 99.999% indium (156.5985 °C), 99.99+% tin (231.93 °C), 99.99+% zinc (419.53 °C), 99.99% silver (961.78 °C), and 99.999% gold (1064.18 °C). The balance was calibrated using alumina mass standards provided by the instrument manufacturer. The heat flow between the pans was calibrated using a sapphire disk provided by the instrument manufacturer. The cell constant was fine-tuned using the heat of fusion of zinc (113 J/g).