Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary information

Massively synthesizable Nickel-doped 1T-MoS_2 nanosheet catalyst as an efficient tri-functional catalyst

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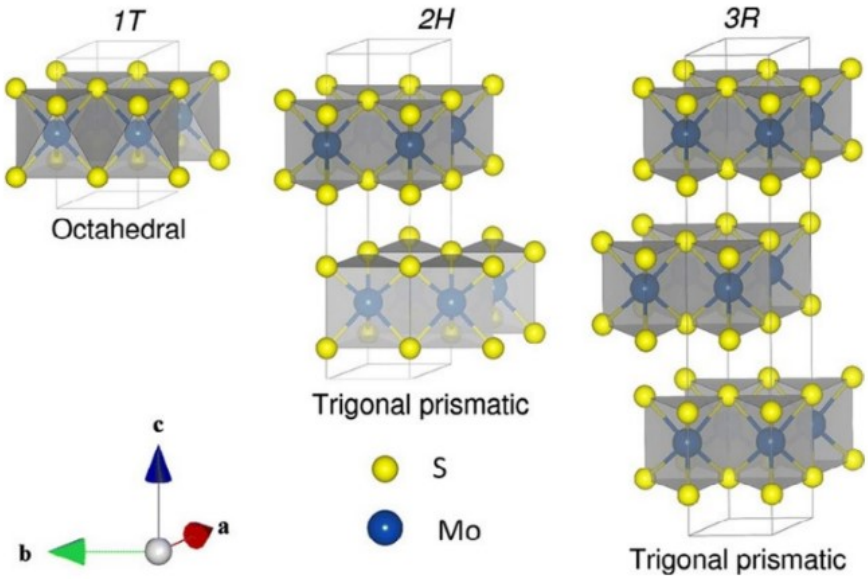

Figure S1. Crystal structure of MoS_2: Octaheral (1T), Trigonal prismatic (2H) and Trigonal prismatic (3R) unit cell structures. Reproduced with permission[1].

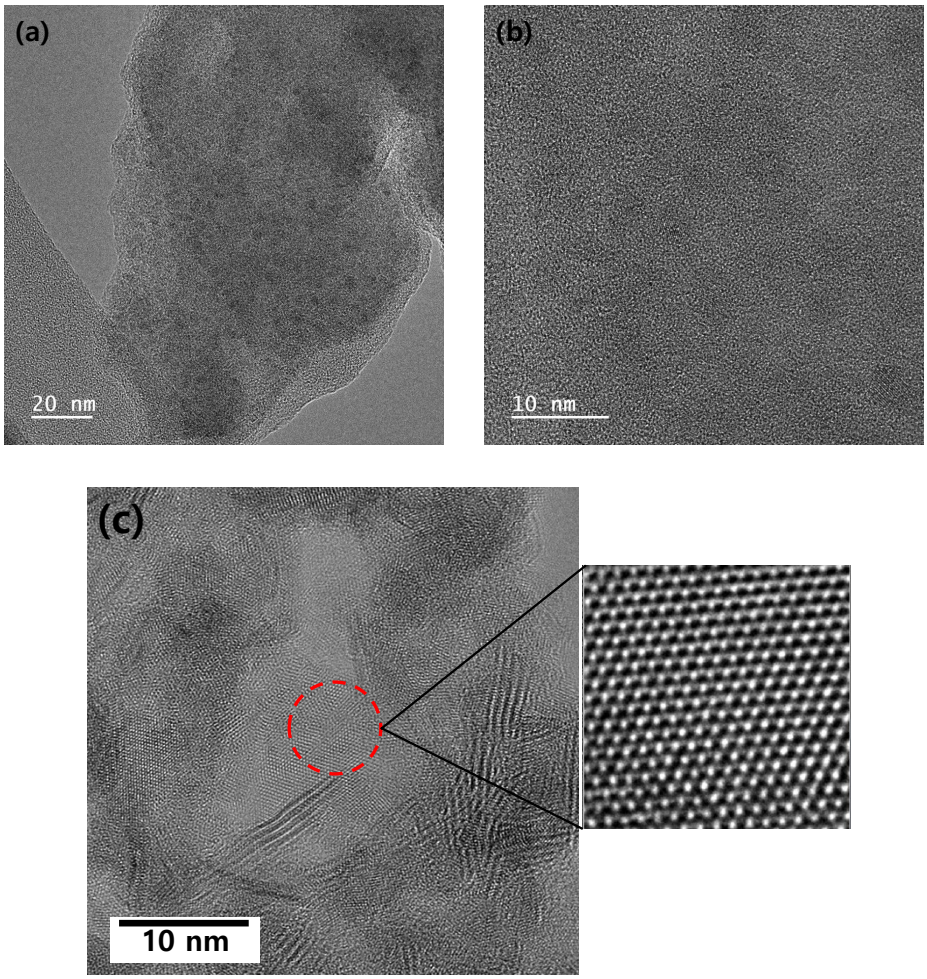

Figure S2. (a) Transmission electron microscopy (TEM) image of as-synthesized Ni-doped MoS_2 nanoparticle on the amorphous 2D Ni-doped MoS_2 sheet, (b) TEM image of Ni-doped MoS_2 crystalline nanoparticle on the amorphous 2D Ni-doped MoS_2 sheet, (c) TEM image of Ni-doped MoS_2 sheet after heat-treatment.

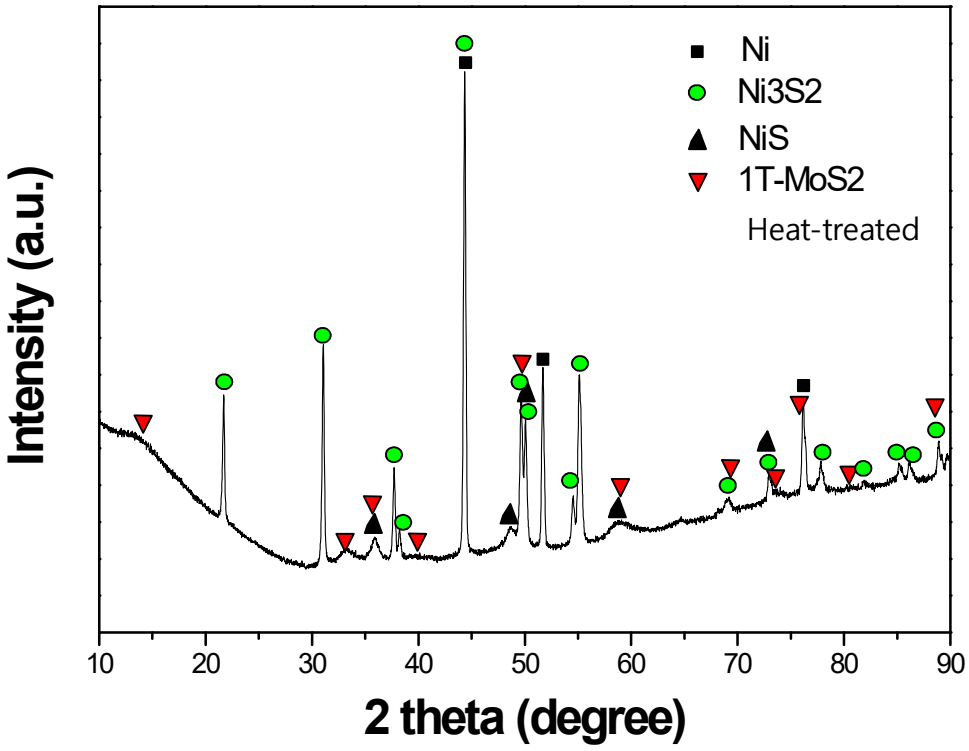

Figure S3. X-ray diffraction analysis result of the Ni-doped 1T-MoS_2

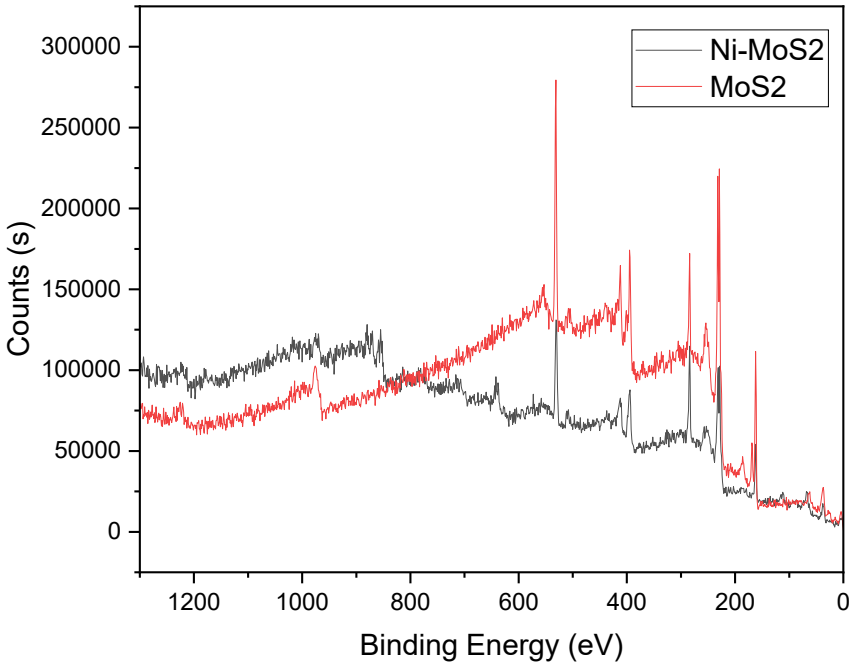

Figure S4. The XPS full spectrum for Ni-MoS_2 and MoS_2.

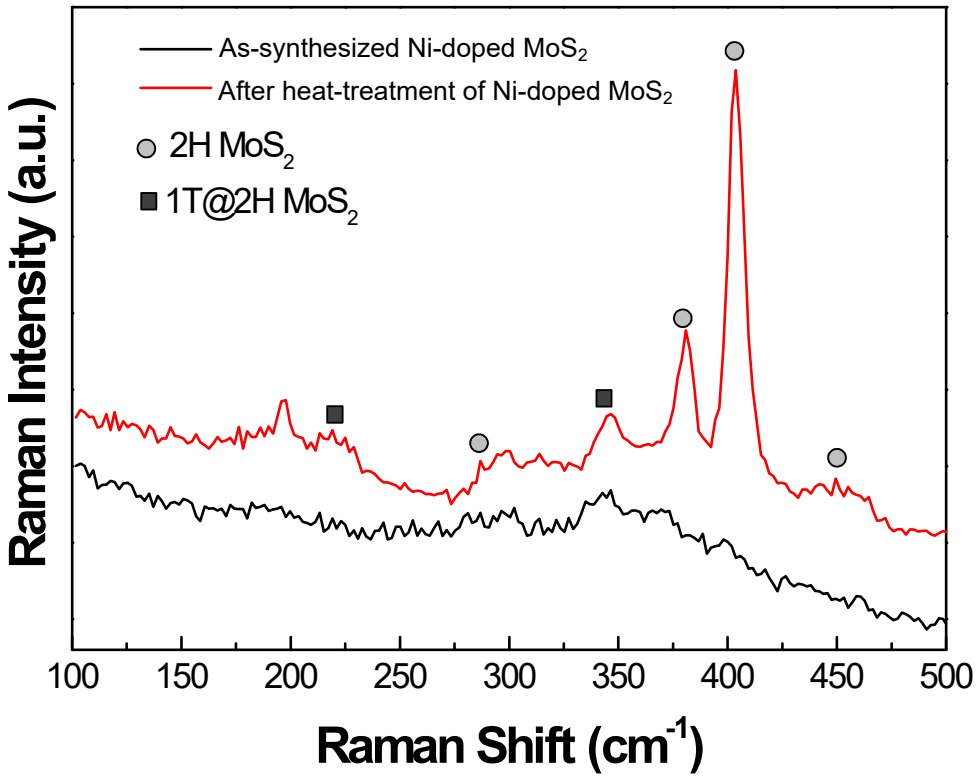

Figure S5. Raman analysis results of Ni-doped MoS_2 before and after heat-treatment

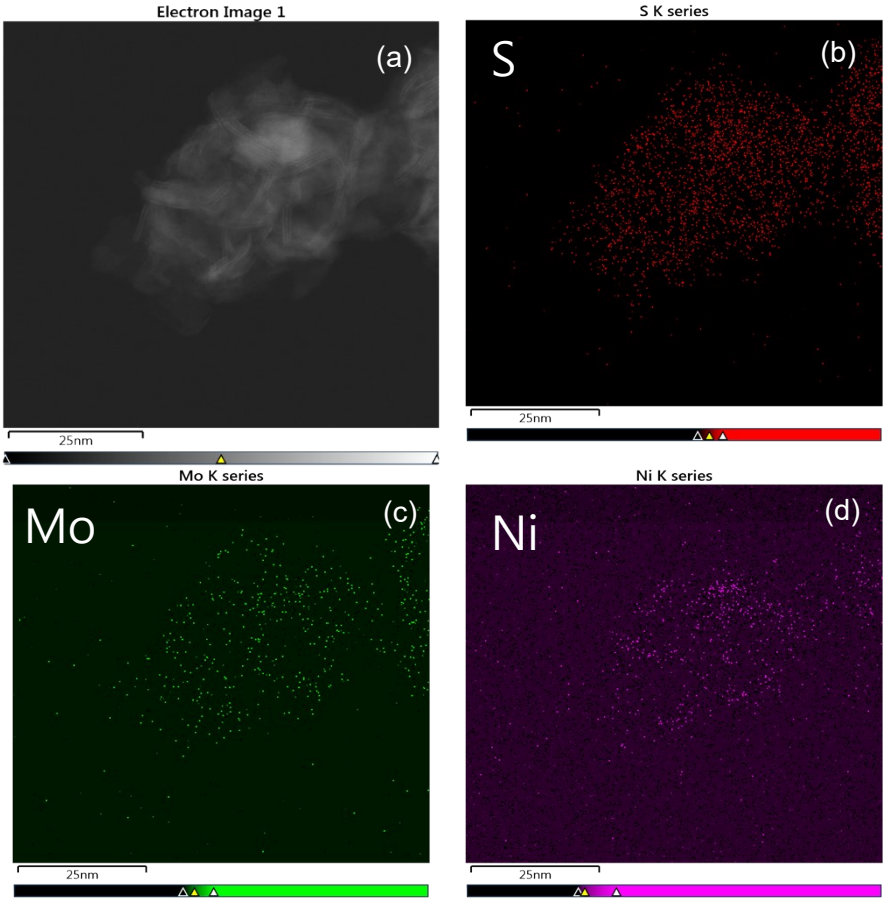

Figure S6. TEM EDS mapping results of Ni-doped 1T-MoS_2. (a) TEM image of Ni-doped MoS_2, (b) TEM EDS mapping result of Sulfur. (c) TEM EDS mapping result of Molybdenum, (d) TEM EDS mapping result of Nickel.

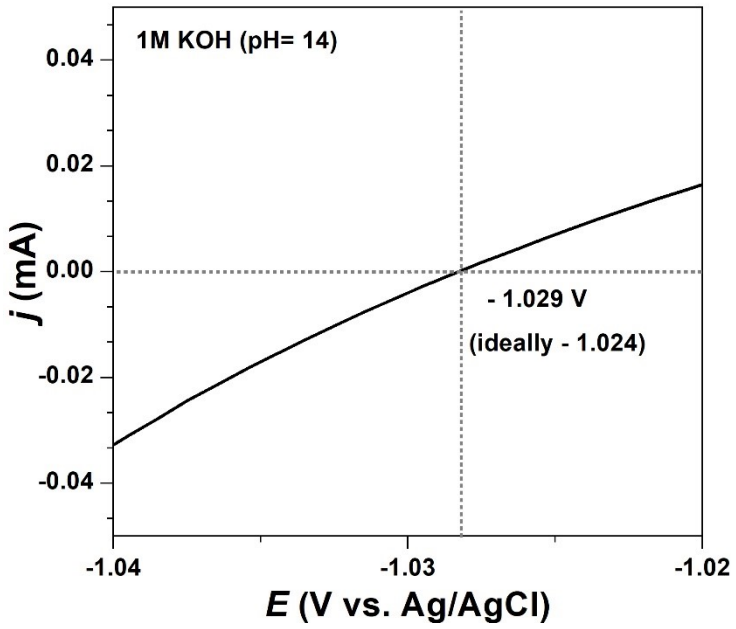

Figure S7. RHE calibration with Pt wires and Ag/AgCl (saturatedd KCl) reference electrode.

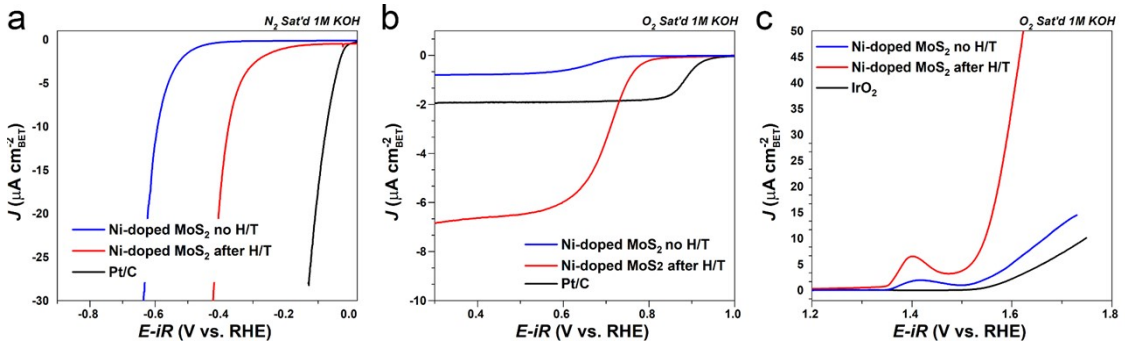

Figure S8. Specific activity normalized to the surface area as a function of potential for (a) HER, (b) ORR, and (c) OER process.

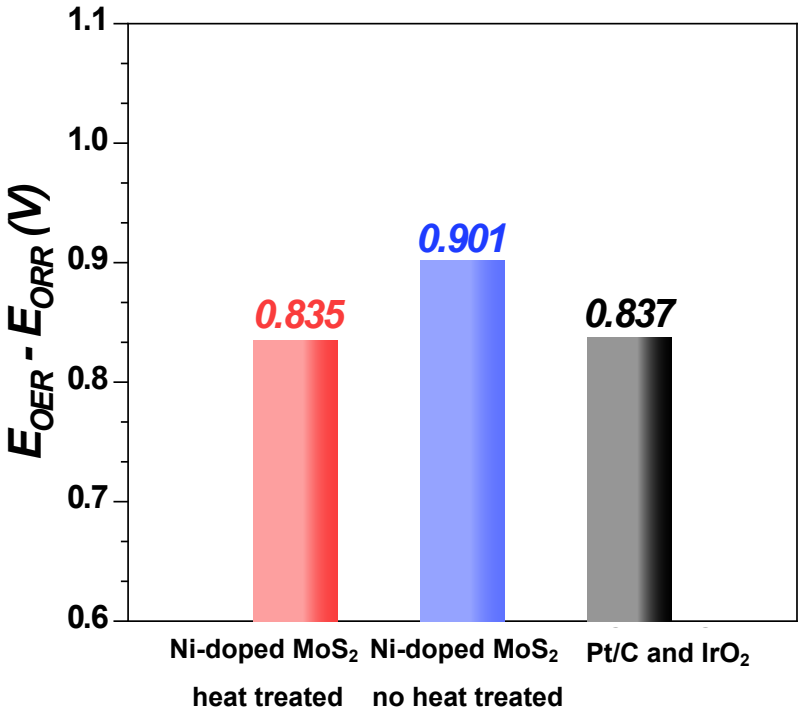

Figure S9. The oxygen evolution reaction (OER) and oxygen reduction reaction (ORR) polarization of Ni-doped 1T MoS_2 (before and after heat-treatment), and the commercial Pt/C and IrO_2.

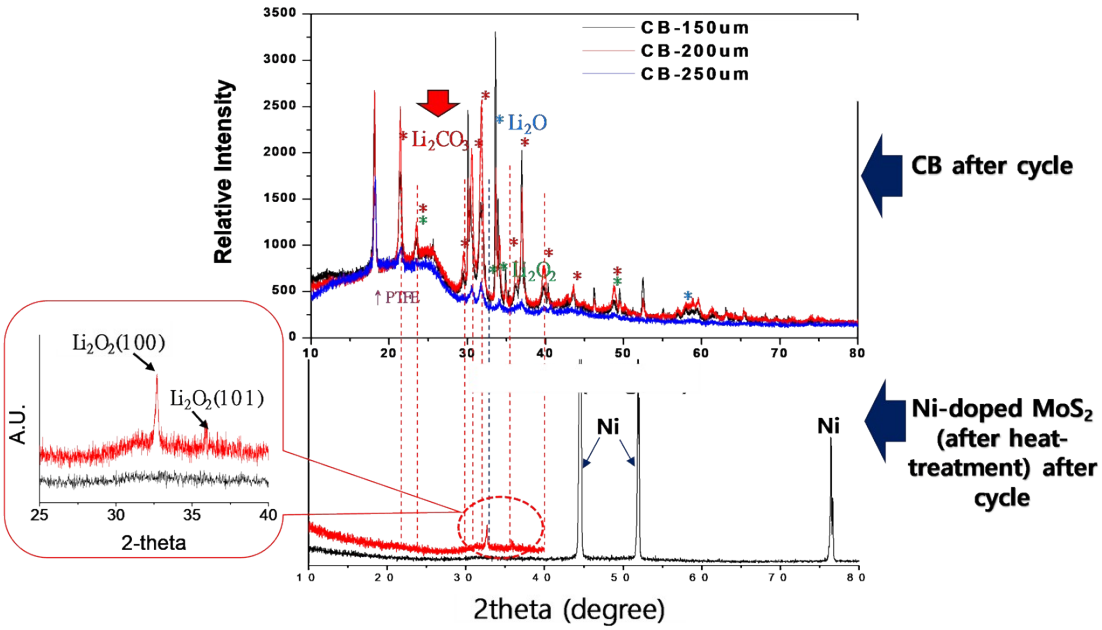

Figure S10. Ni-doped 1T MoS_2 showed no evidence of Li_2CO_3 after the cycle test

References

1. Kuc, A. 2015. Low-dimensional transition-metal dichalcogenides. Pp. 1–29 in M. Springborg, and J. Joswig, ed. Chemical modelling: Volume 11. The Royal Society of Chemistry, London, UK