IOCN 2025 Conference

The 5th International Online Conference on Nanomaterials

22–24 September 2025 | Online

MDPI

Sn-doped NiFe LDH/Carbon Nanotube composite: An Efficient Bifunctional Electrocatalyst for Water Splitting

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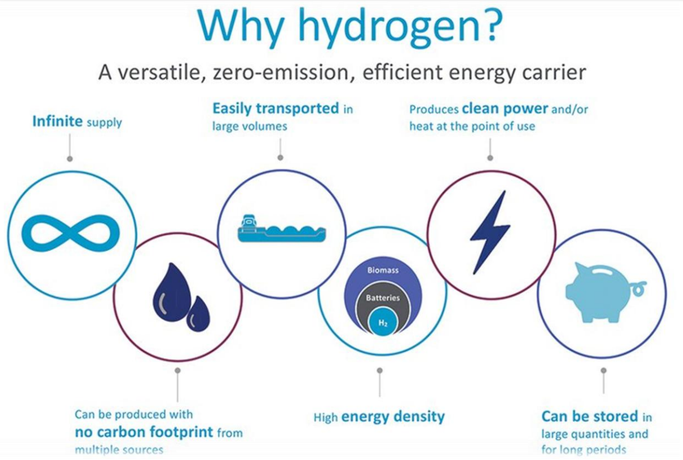
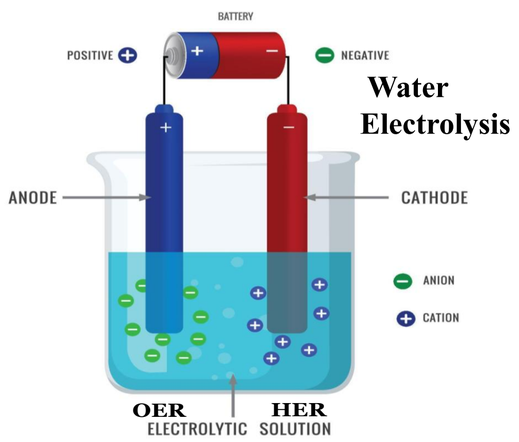
INTRODUCTION & AIM

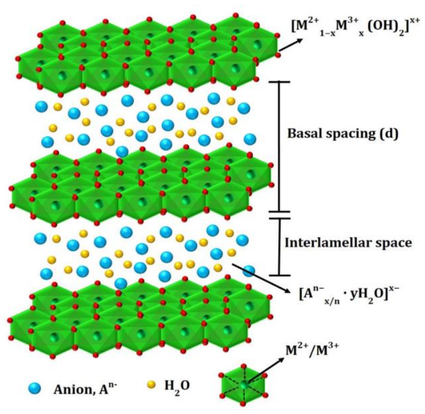


Sustainable Development Goals (SDG)

LDH's general formula:

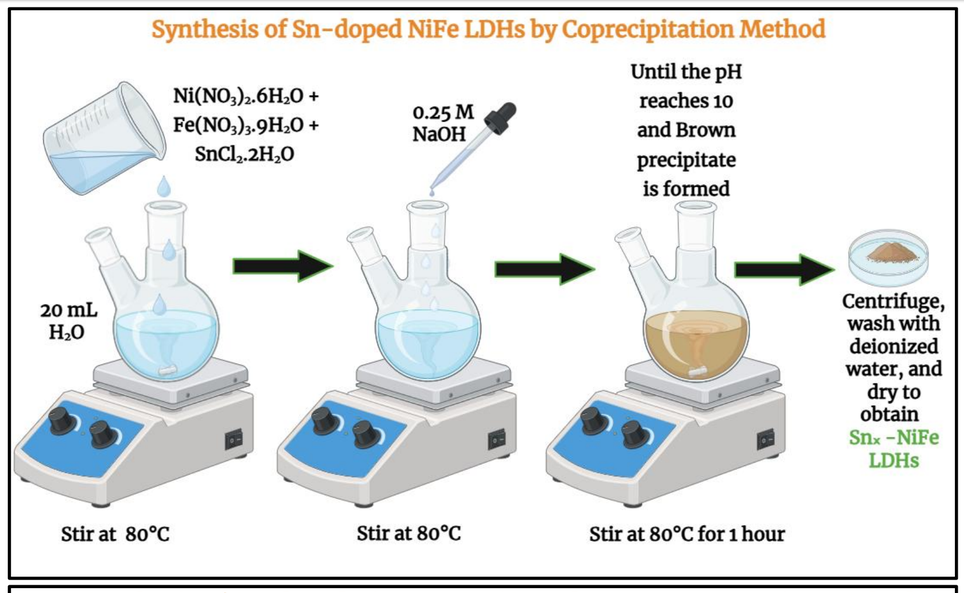
$[M(II)_{1-x}M(III)_x(OH)_2]\ (A^{n-})_{x/n}.yH_2O$

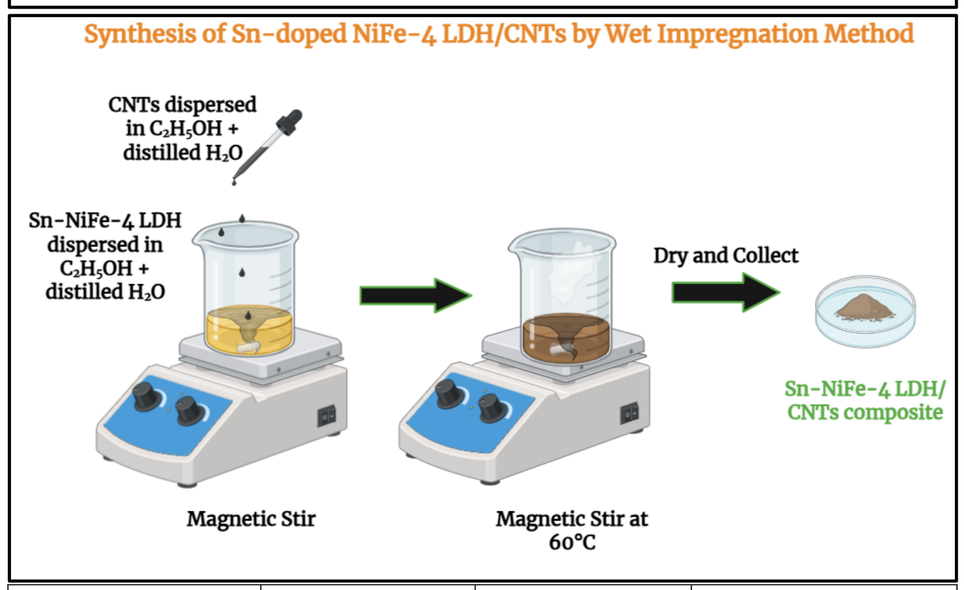




***AIM:** Synthesis and Optimization of Sn-doped NiFe LDH/Carbon Nanotube composite as an Electrocatalyst for Water Splitting.*

METHOD





Samples Prepared	Ni (mmol)	Fe (mmol)	Sn (mmol)
NiFe LDHs	0.66	0.33	0
Sn-NiFe-1 LDHs	0.66	0.33	0.0033
Sn-NiFe-2 LDHs	0.66	0.33	0.0165
Sn-NiFe-3 LDHs	0.66	0.33	0.033
Sn-NiFe-4 LDHs	0.66	0.33	0.066
Sn-NiFe-5 LDHs	0.66	0.33	0.078
Sn-NiFe-4/CNTs	**(1.2wt% of CNT optimized)**		

RESULTS & DISCUSSION

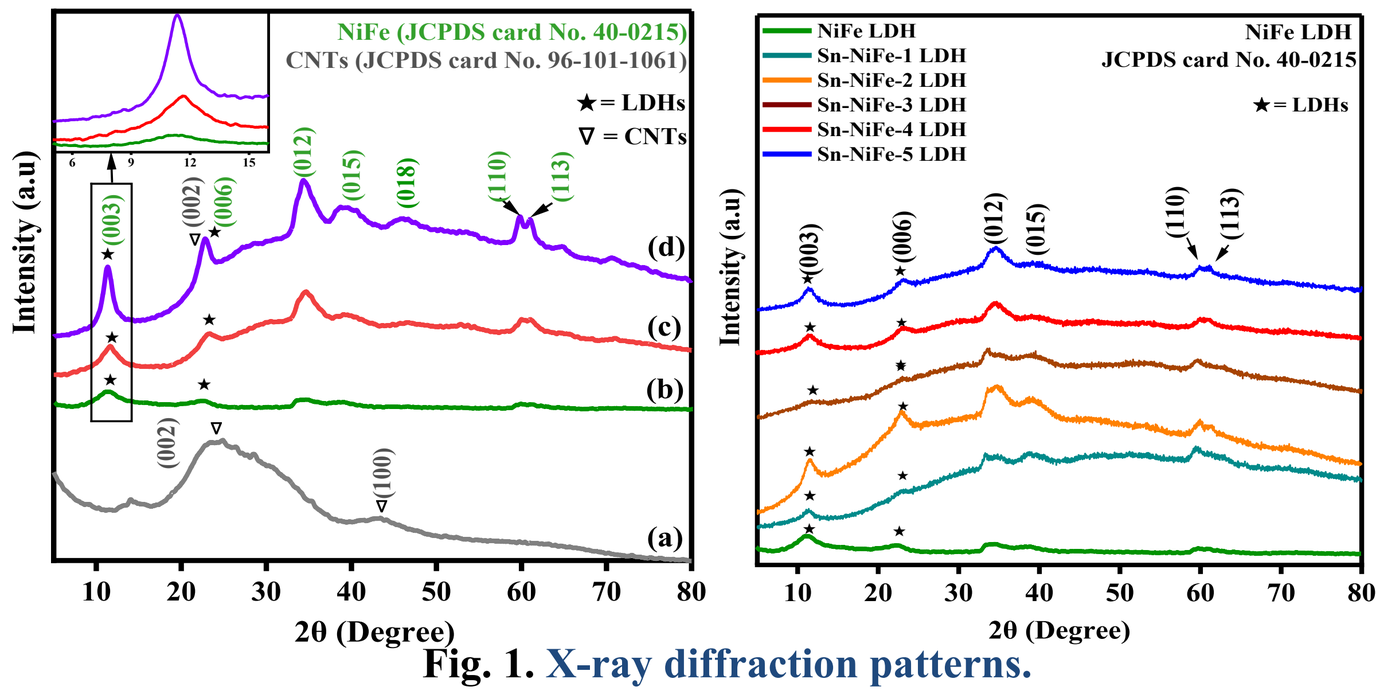


Fig. 1. X-ray diffraction patterns.

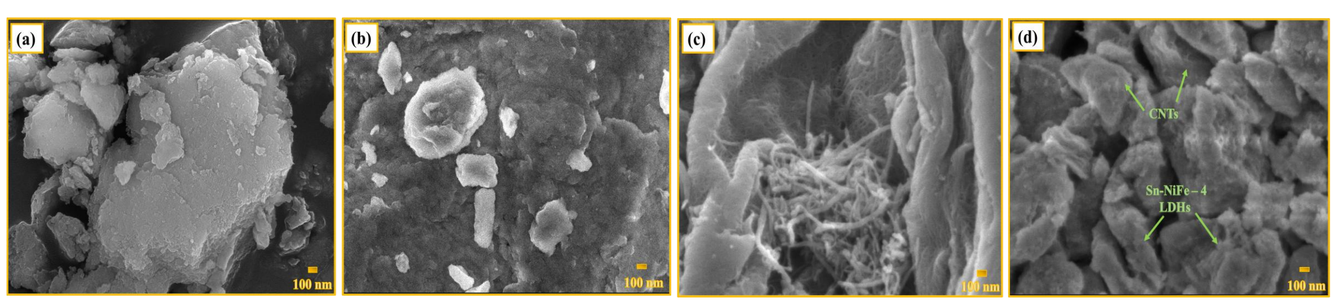


Fig. 2. FESEM images of (a) NiFe LDH, (b) Sn-NiFe-4 LDH, (c) CNTs, (d) Sn-NiFe-4/CNTs.

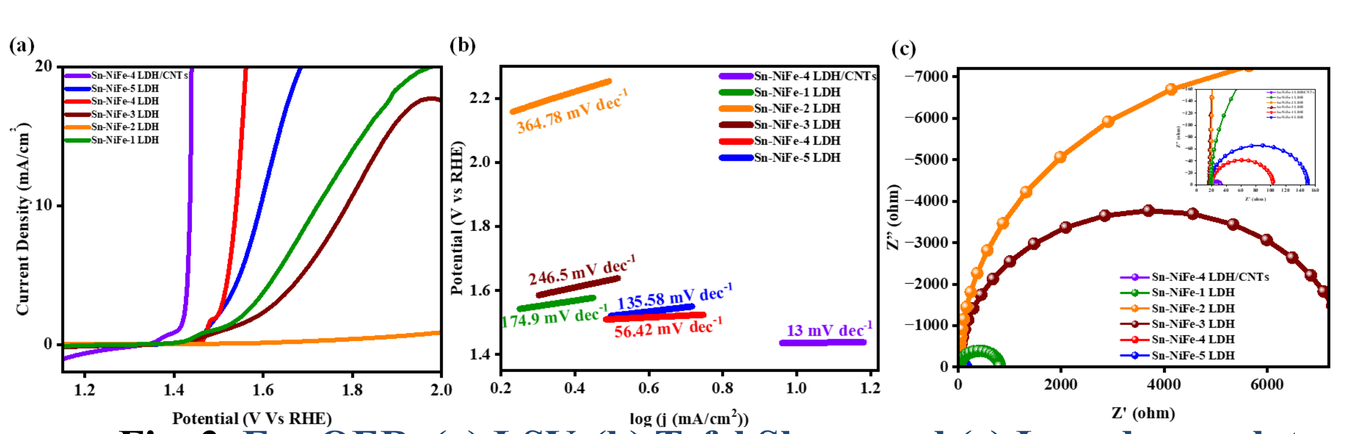


Fig. 3. For OER, (a) LSV, (b) Tafel Slope, and (c) Impedance plot.

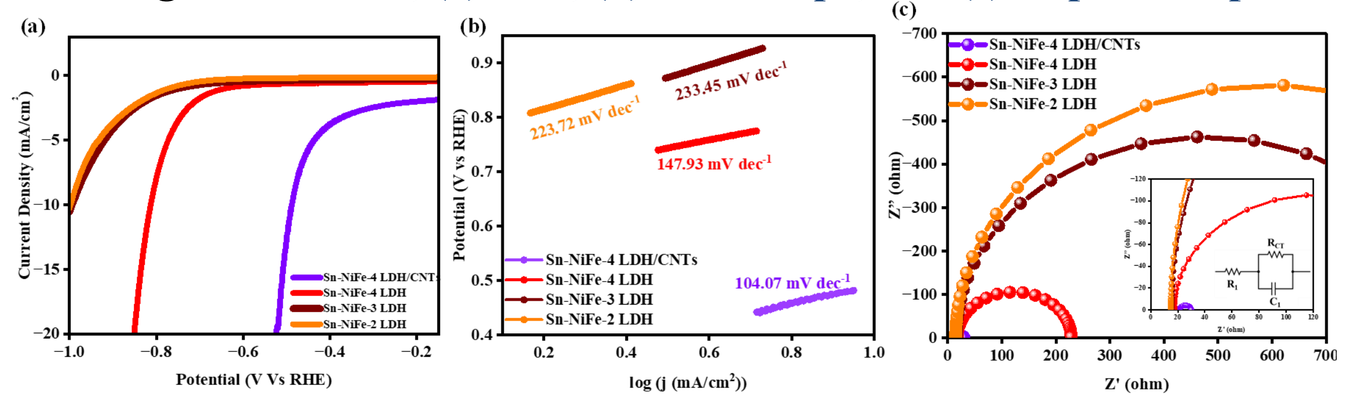


Fig. 4. For HER, (a) LSV, (b) Tafel Slope, and (c) Impedance plot.

CONCLUSION

- XRD revealed that the incorporation of CNTs enhances both the peak intensity and decreases the peak broadness, suggesting enhanced crystallinity or better stacking.
- Sn-NiFe-4 LDH/CNTs have the lowest HER (488) and OER (203) overpotential.
- Sn-NiFe-4 LDH/CNTs have the lowest R_{CT}.

Thus, Sn-NiFe-4 LDH/CNTs outperformed other prepared electrocatalysts for both OER/HER activity.

FUTURE WORK / REFERENCES

- **XPS:** Analyze surface composition & electronic structure after Sn doping.
- **HRTEM:** Visualize lattice fringes & confirm Sn incorporation.
- **Stability Tests**: Long-term chronoamperometry at high current density.

Ali, A.; Shen, P. K. J. E. E. R., Recent progress in graphene-based nanostructured electrocatalysts for overall water splitting. 2020, 3, 370-394.