

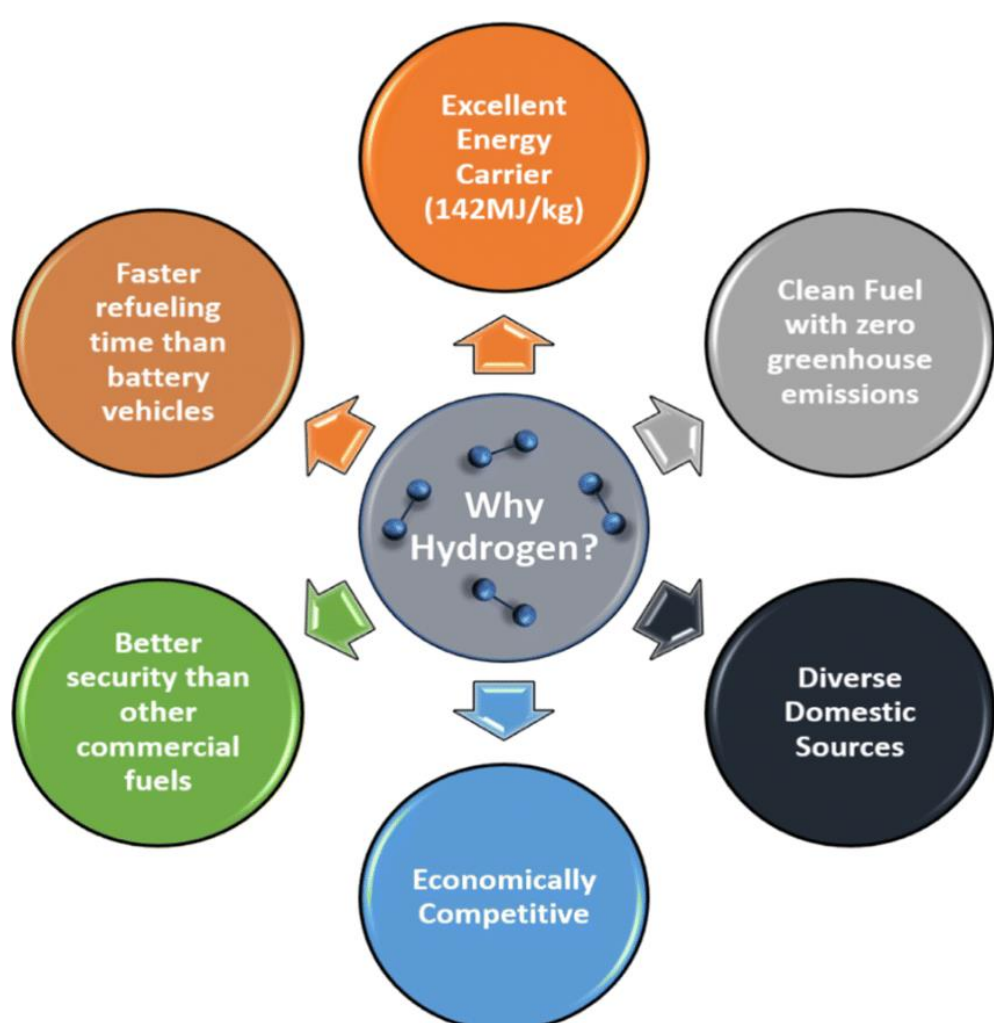
## Impact of Synthesis Methods on the Crystallinity, Morphology, and Electrocatalytic Performance of $\text{SrCo}_{0.6}\text{Mn}_{0.4}\text{O}_3$ Perovskite Oxides

Rohit Kumar<sup>a</sup>, Samriti Mehta<sup>a</sup>, Rajni Thakur<sup>a</sup>, Shwetharani R.<sup>b</sup>, Itika Kainthla<sup>a\*</sup>

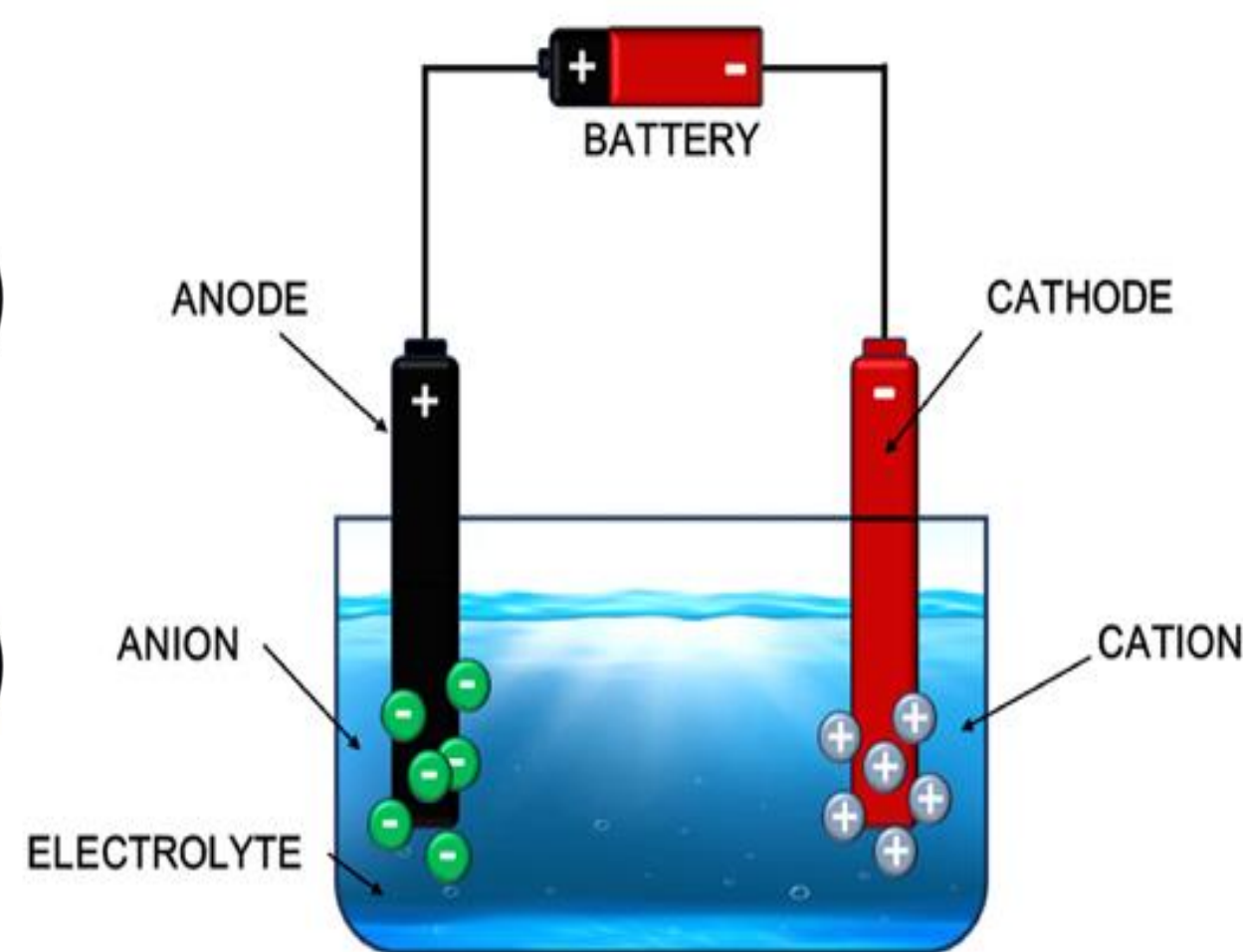
<sup>a</sup> School of Physics and Materials Science, Shoolini University, Solan, India 173229

<sup>b</sup> Centre for Nano and Material Sciences, Jain (Deemed-to-be University), Jain Global Campus, Kanakapura, Bangalore, Karnataka 562112, India

### INTRODUCTION & AIM



Properties of Hydrogen



Schematic illustration of Water Electrolysis

### RESULTS & DISCUSSION

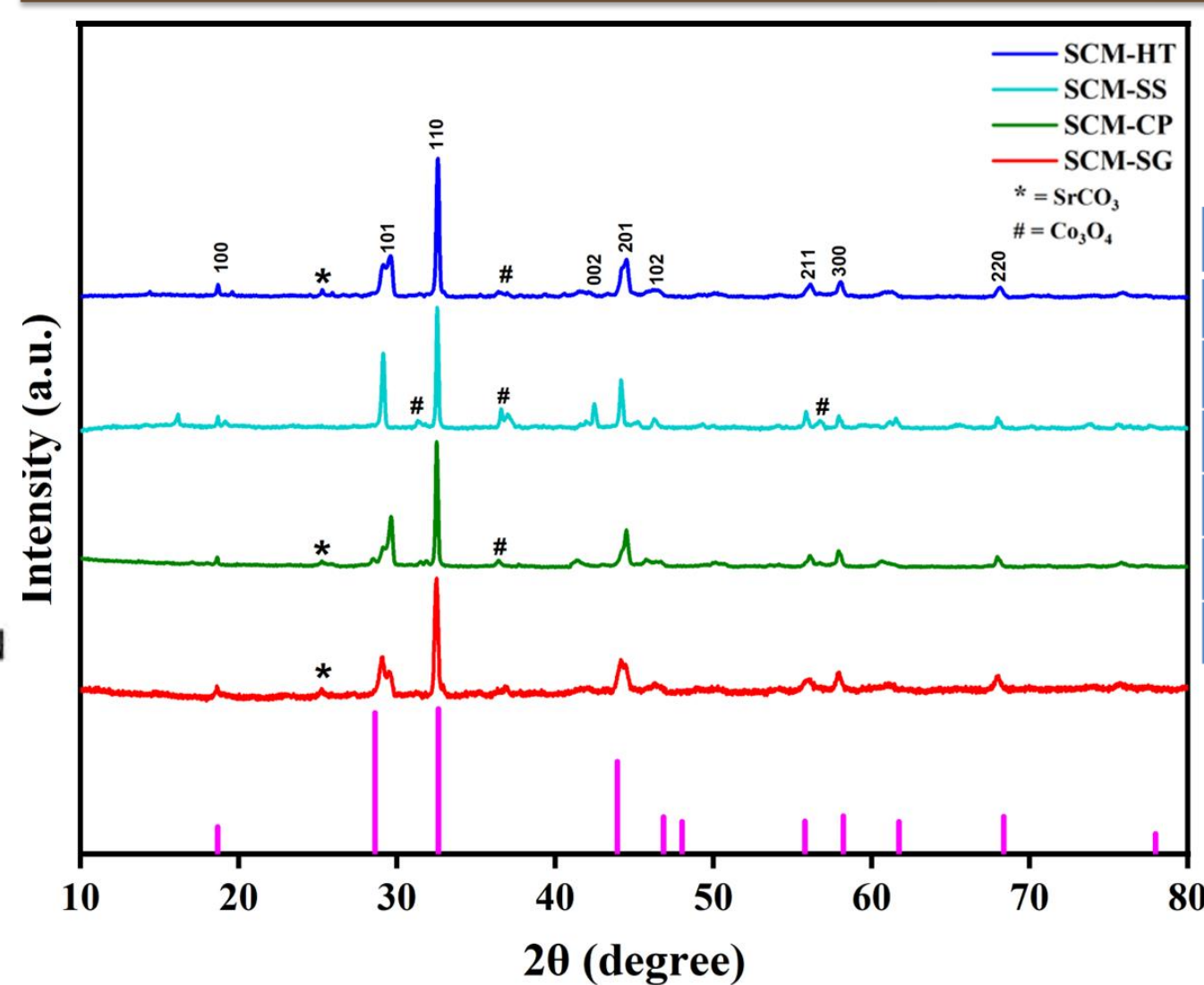


Table 1: Values of crystallite size and strain of the prepared samples

| Sr. No. | Material | Crystallite Size (nm) |             | Strain(ε) |
|---------|----------|-----------------------|-------------|-----------|
|         |          | Scherrer formula      | W-H formula |           |
| 1.      | SCM-SG   | 35                    | 57.40       | 0.00122   |
| 2.      | SCM-CP   | 42                    | 77.41       | 0.0012    |
| 3.      | SCM-SS   | 54                    | 122.67      | 0.00122   |
| 4.      | SCM-HT   | 37                    | 104.89      | 0.00201   |

Figure 2: X-ray Diffraction (XRD) patterns of prepared perovskite oxides.

### METHOD

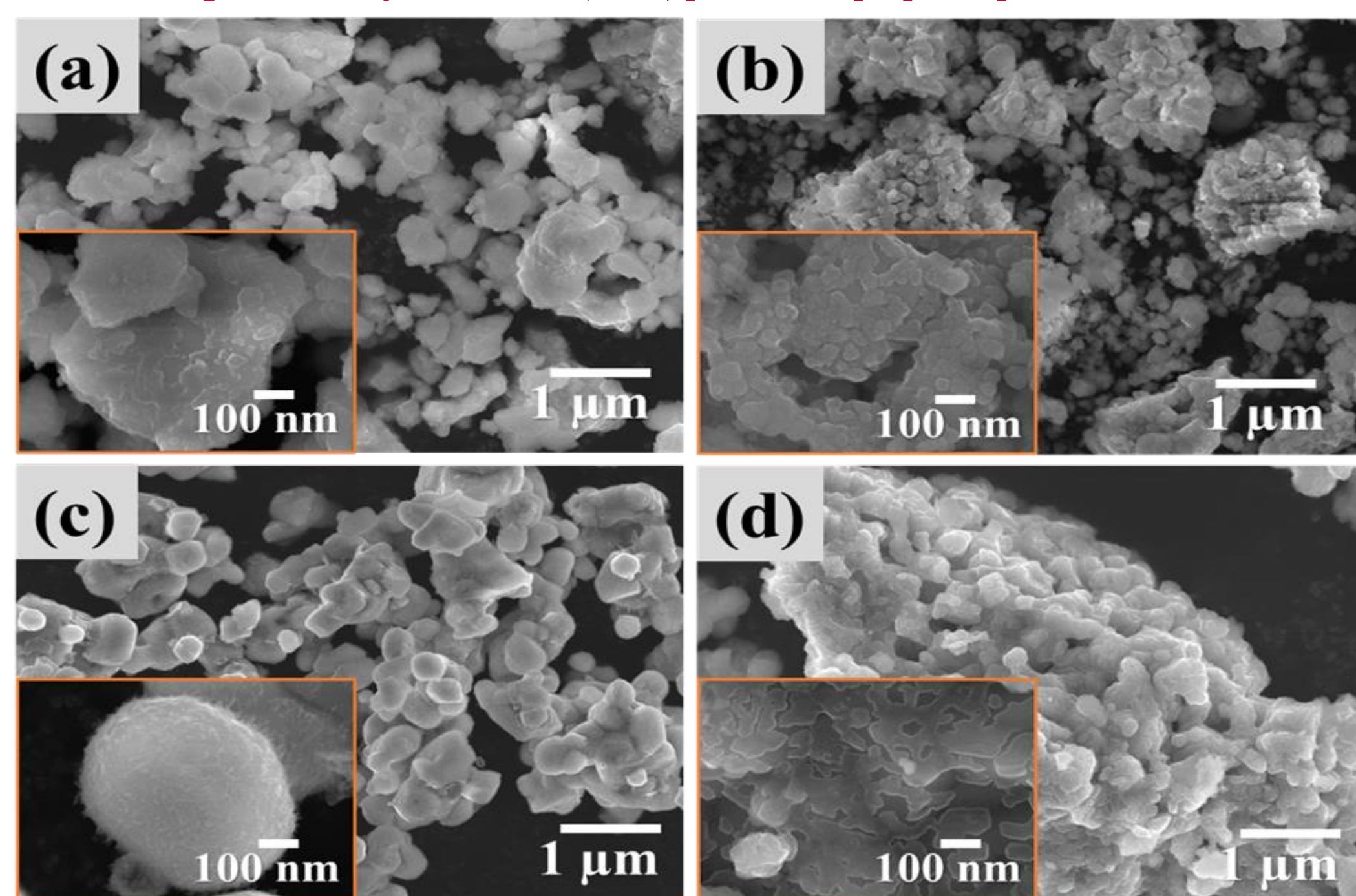
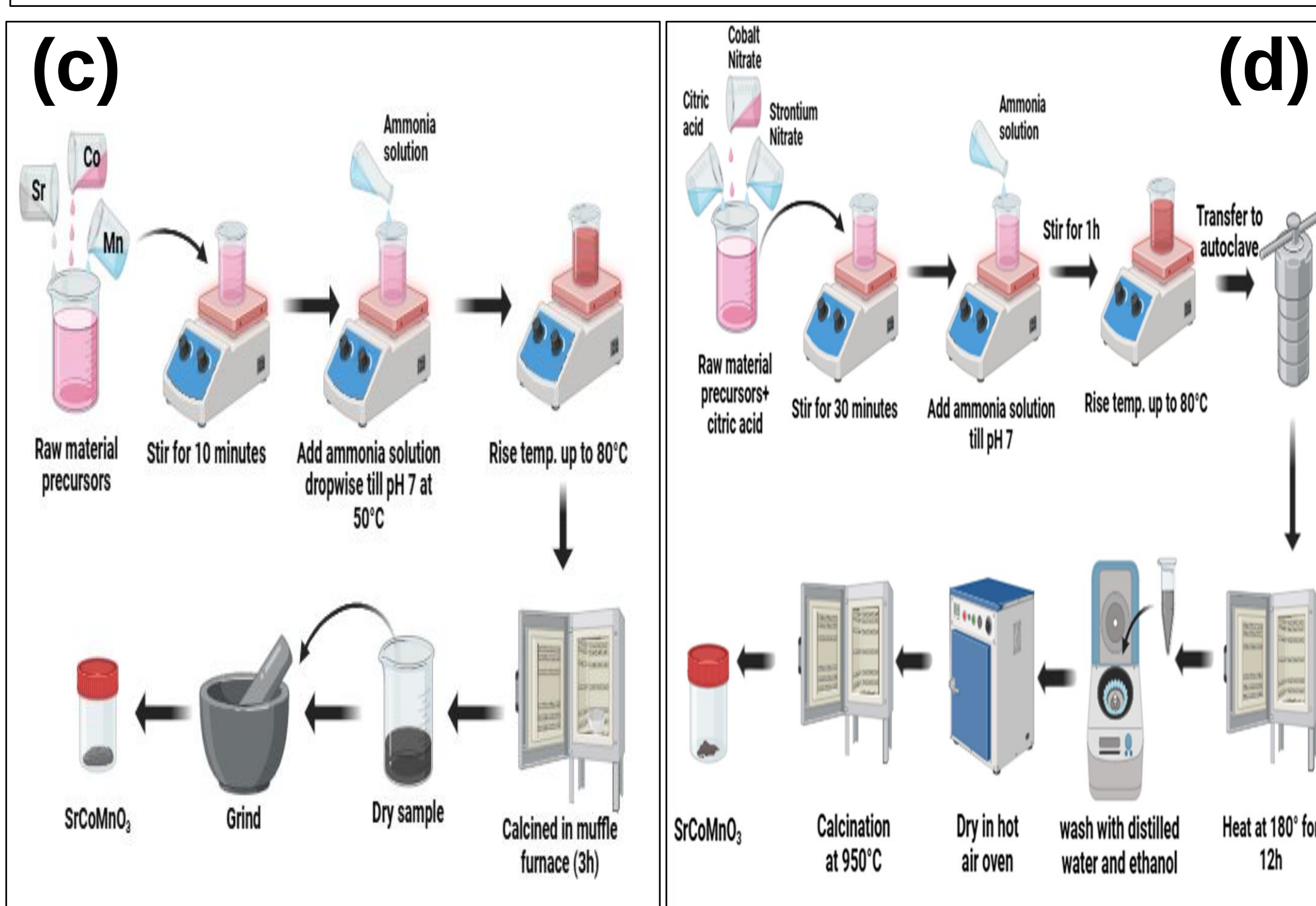
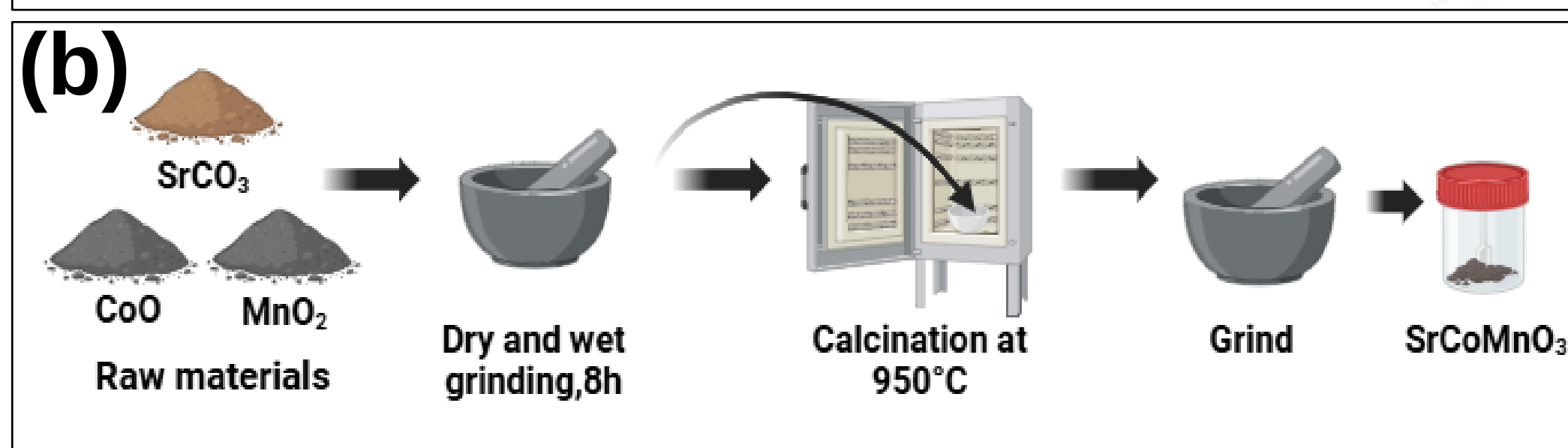
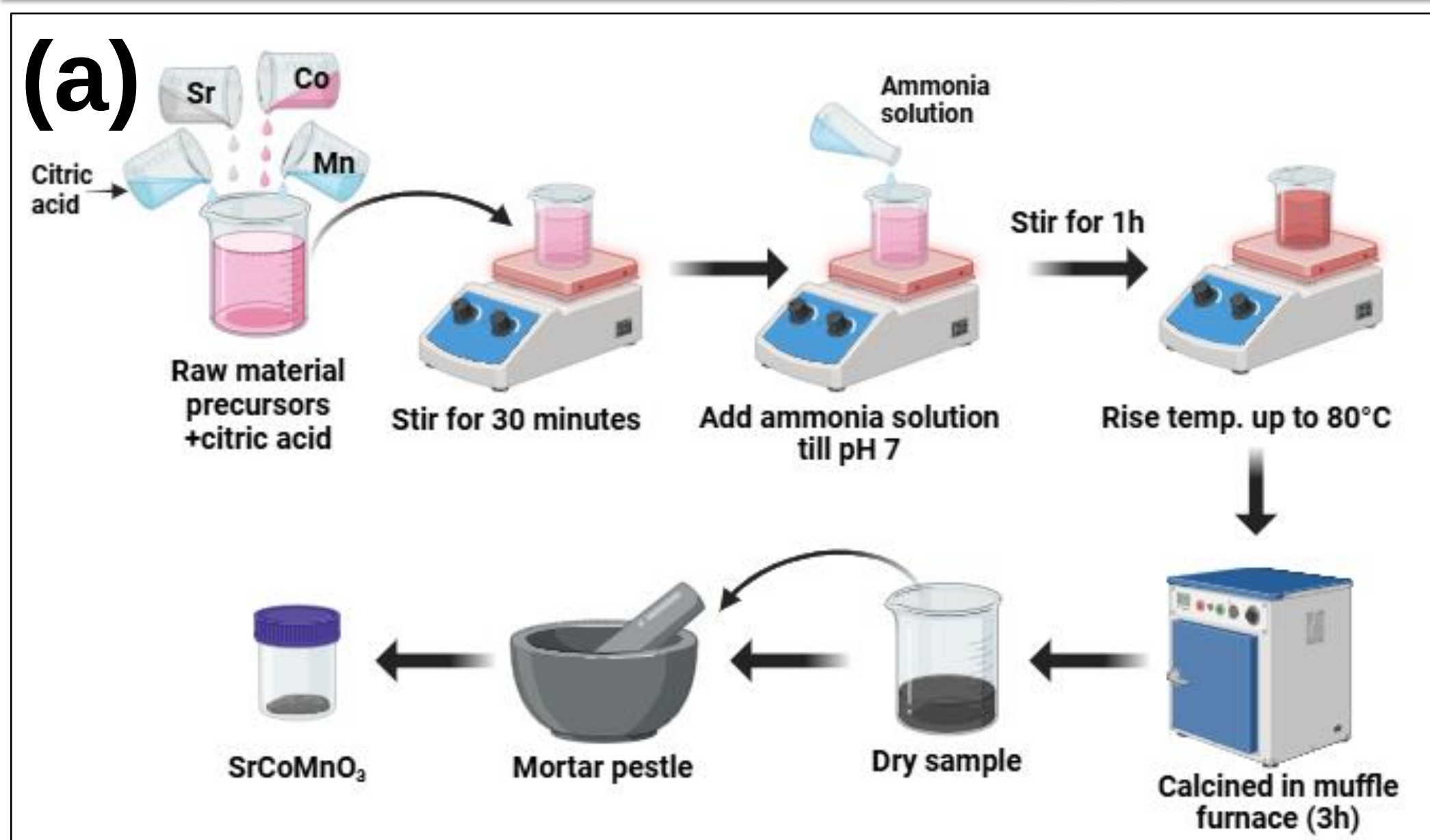


Figure 3: Field Emission Scanning Electron Microscopy (FESEM) of (a) SCM-SG, (b) SCM-CP, (c) SCM-SS, and (d) SCM-HT

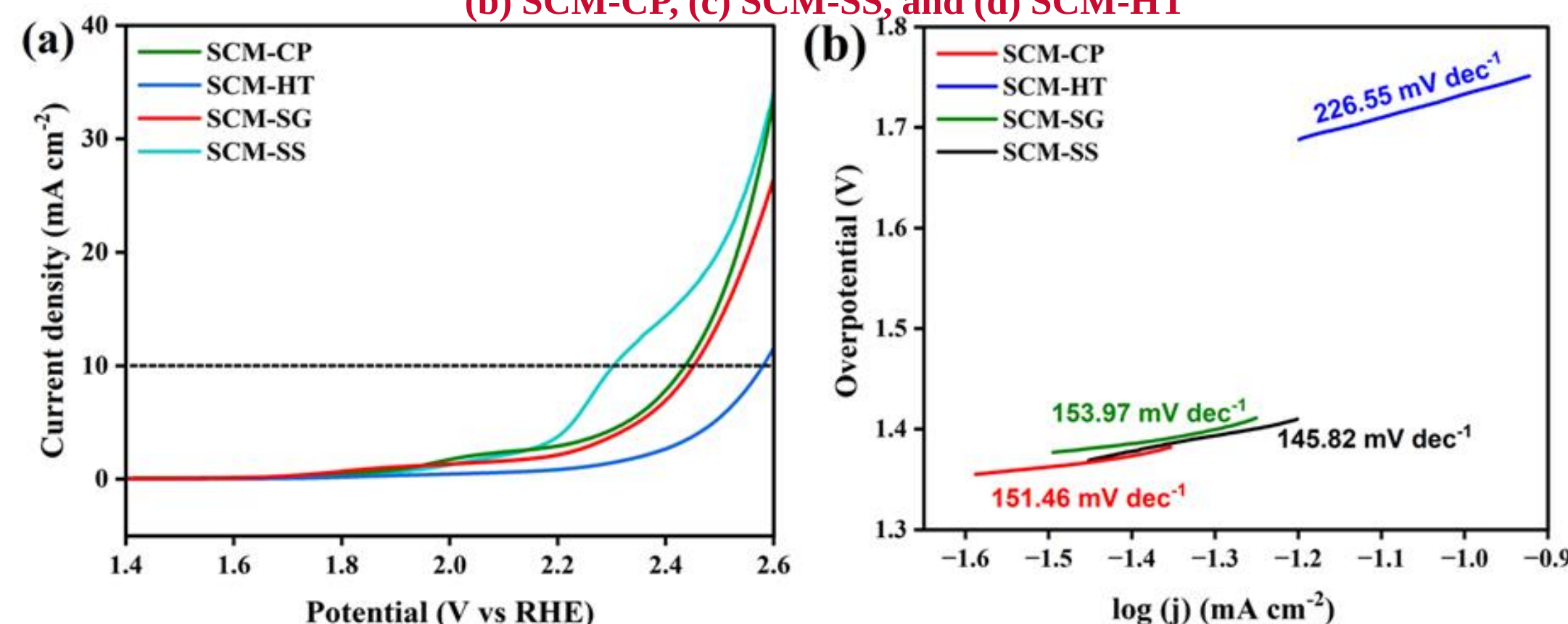


Figure 4: (a) Linear sweep voltammetry graphs, (b) Tafel slopes of prepared samples for Oxygen Evolution Reaction (OER)

### CONCLUSION

- Synthesized  $\text{SrCo}_{0.6}\text{Mn}_{0.4}\text{O}_3$  perovskites by different methods to study the influence of crystallinity and morphology on their electrochemical performance.
- Among all routes, the solid-state synthesized sample showed the best OER activity with an overpotential of 1.07 V at 10  $\text{mA cm}^{-2}$  and a Tafel slope of 145.82  $\text{mV dec}^{-1}$ .
- The enhanced performance is attributed to high crystallinity, phase purity, and an optimized Co/Mn-O framework that promotes efficient charge transfer.

### FUTURE WORK / REFERENCES

**FUTURE WORK:** Advanced studies using XPS and HRTEM will be conducted to gain deeper insights into surface chemistry and lattice structure.

**REFERENCES:** Kumar, R., et al., Progress in Perovskite Oxide Electrocatalysts for Efficient Hydrogen and Oxygen Evolution Reactions. 2025: p. 1-30.

Kumar, R., et al., Quaternary Transition Metal Dichalcogenides ( $\text{M}_{1-x}\text{N}_x\text{X}_2$  (1-y)  $\text{Y}_2\text{y}$ ) for Hydrogen Evolution: A Review on Atomic Structure, 3D Engineering, and Electrocatalytic Performance. 2025: p. 100532.

Figure 1: Schematic illustration of the synthesis of  $\text{SrCoMnO}_3$  by the (a) sol-gel, (b) solid-state, (c) co-precipitation, and (d) hydrothermal method