

Faculty and PostDoc, Science and Engineering

Combustion-Free Synthesis of Lithium Manganese Oxide Composites with CNTs/GNPs by Chemical Coprecipitation for Energy Storage Devices

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Abstract

- LiMn_2O_4 displays poor cyclic performance, so its composite with carbon nanostructures (CNTs & GNPs) was synthesized.
- Cathode material LiMn_2O_4 uniformly coated on CNTs & GNPs was synthesized using the chemical coprecipitation method.
- LiMn_2O_4 -C composite shows an improved electrochemical performance, even at higher discharge rates.

Introduction

- For high-performance batteries, the cathode material should operate at high voltage and have high capacity.
- LiMn_2O_4 has both benefits of operating at a high voltage of around and showing a high capacity of around 147-mAhg^{-1} .
- Therefore, LiMn_2O_4 has the potential to be used in high-performance lithium-ion batteries.
- However, LiMn_2O_4 suffers from poor cyclic performance due to the Jahn-Teller effect.
- Even at elevated temperatures, carbon nanostructure (CNTs and GNPs) provide structural stability to LiMn_2O_4 -C composites.
- Additionally, the entangled structure of CNTs & GNPs provides intercalation sites to Li^+ ions.

Experimental

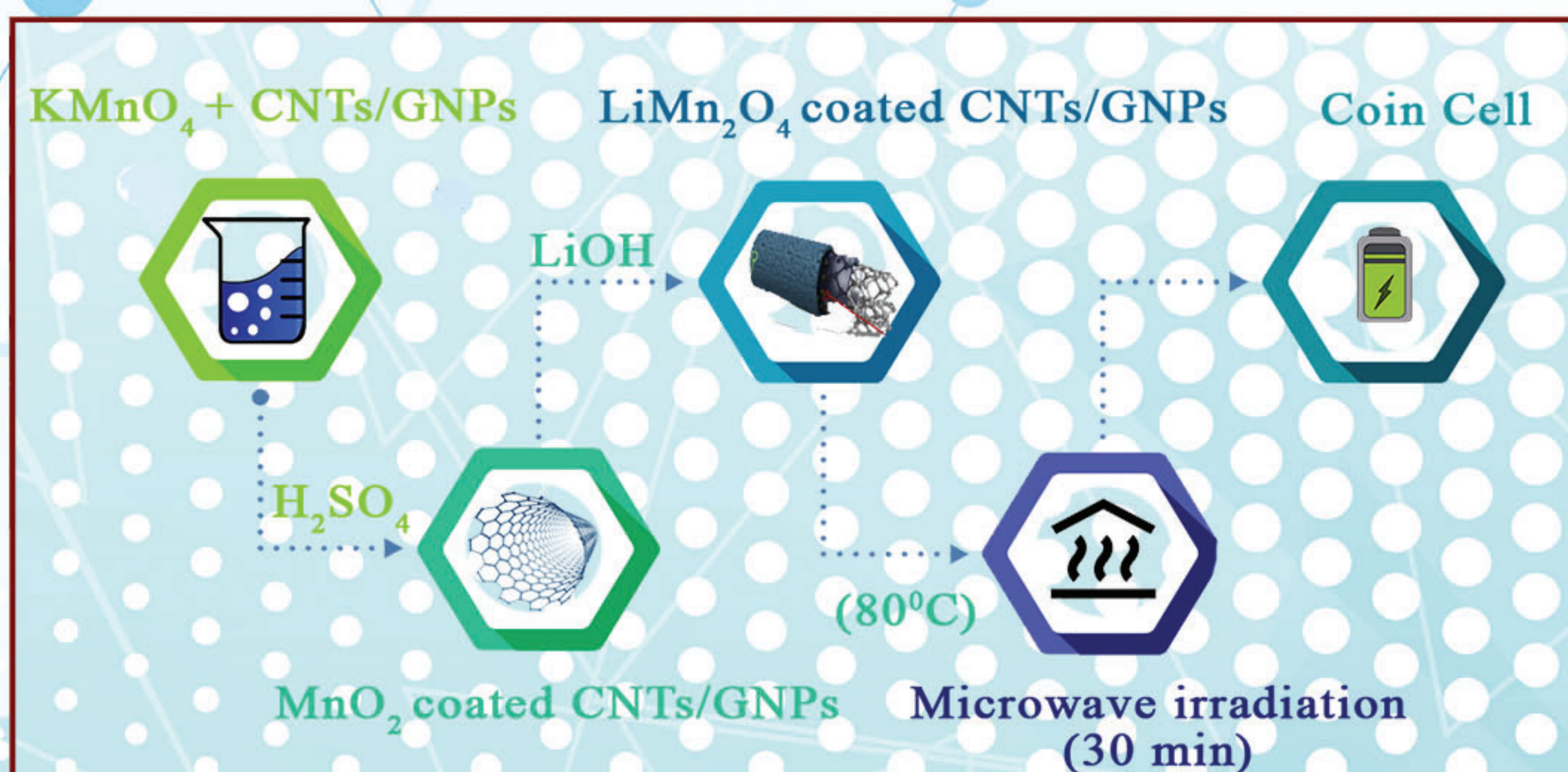


Fig-1: Synthesis of LiMn_2O_4 -C composites.

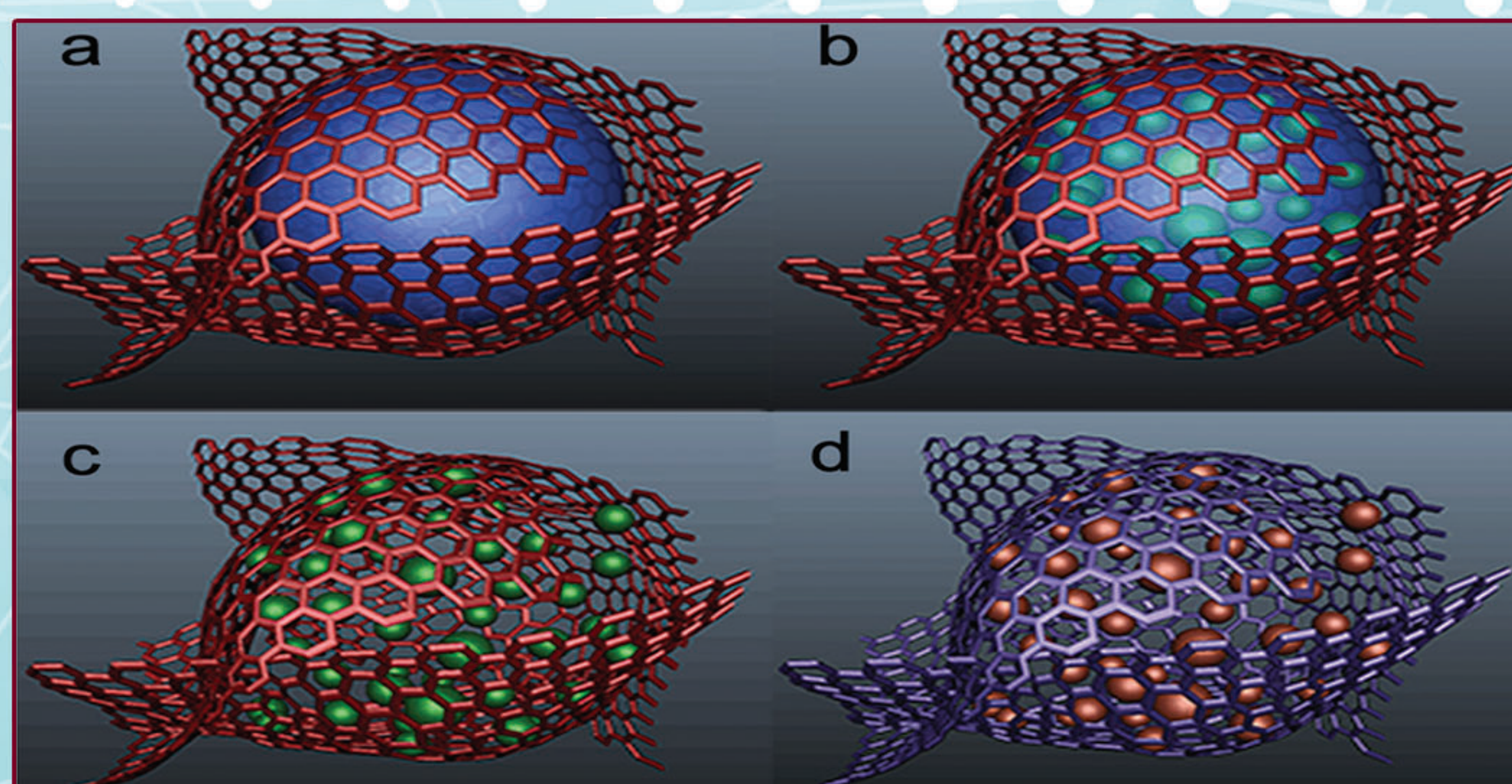


Fig-2: Deposition of metal oxide particles on CNTs/GNPs.

Results

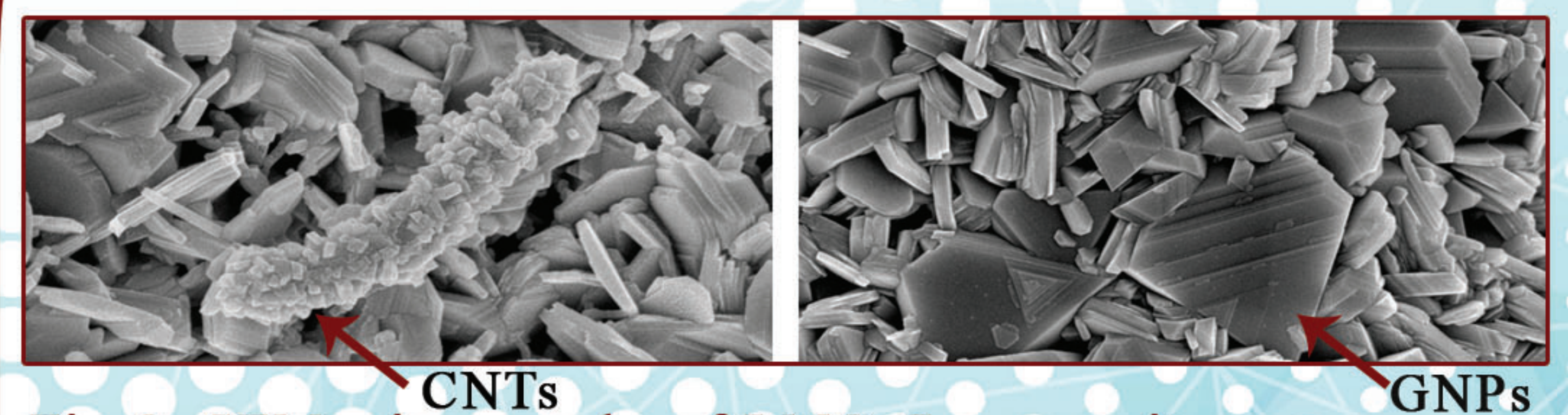


Fig-3: SEM micrographs of LMO-C composites.

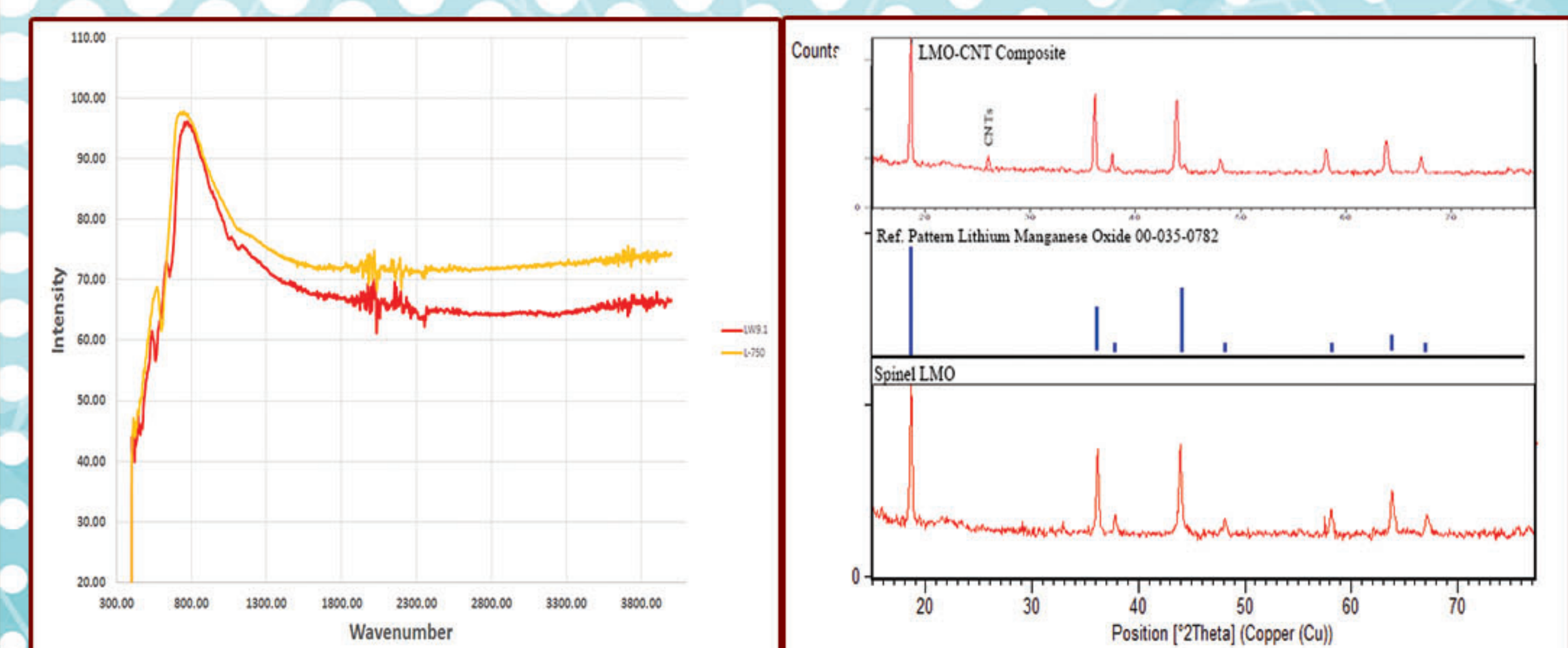


Fig-4: FTIR and XRD spectra of LMO-C composites.

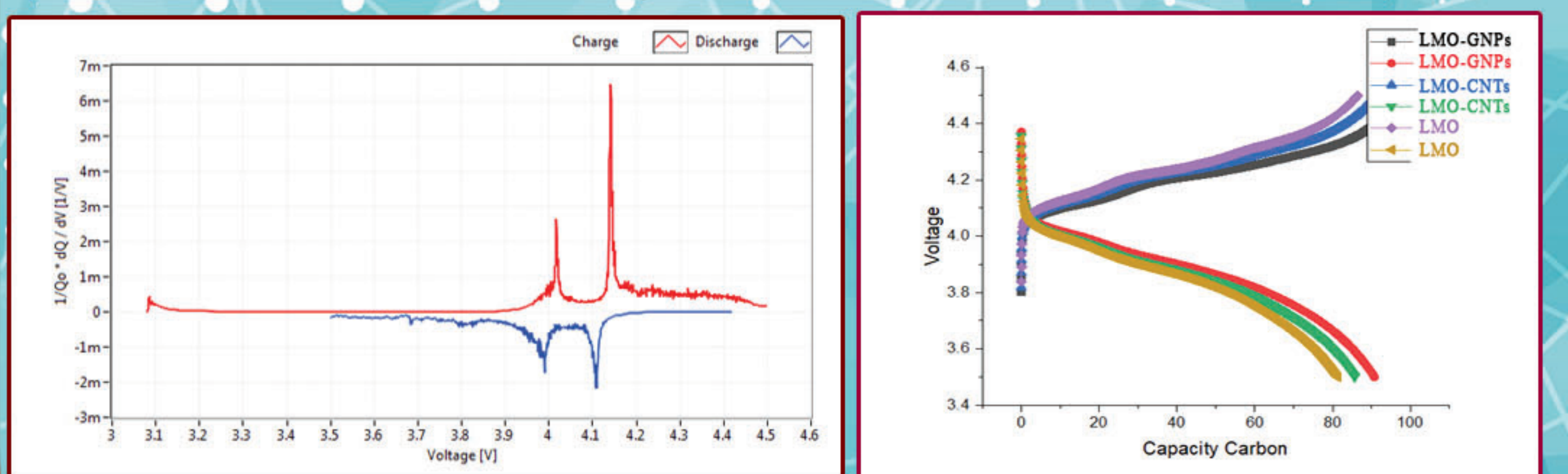


Fig-5: Cyclic voltammogram & initial capacity at 1C rate.

Conclusion

- LiMn_2O_4 -C composite has been synthesized successfully by chemical coprecipitation.
- XRD and SEM results confirmed the synthesis of LMO-C composite in a single pure phase.
- As compared to pure LMO, the composite shows better electrochemical performance.

Acknowledgment

This work was made possible by research grant (NPRP11S-1225-170128) from Qatar National Research Fund (a member of Qatar Foundation).