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# Graphite Oxide as a High-Capacity Precursor for Advanced Lithium-Ion Batteries

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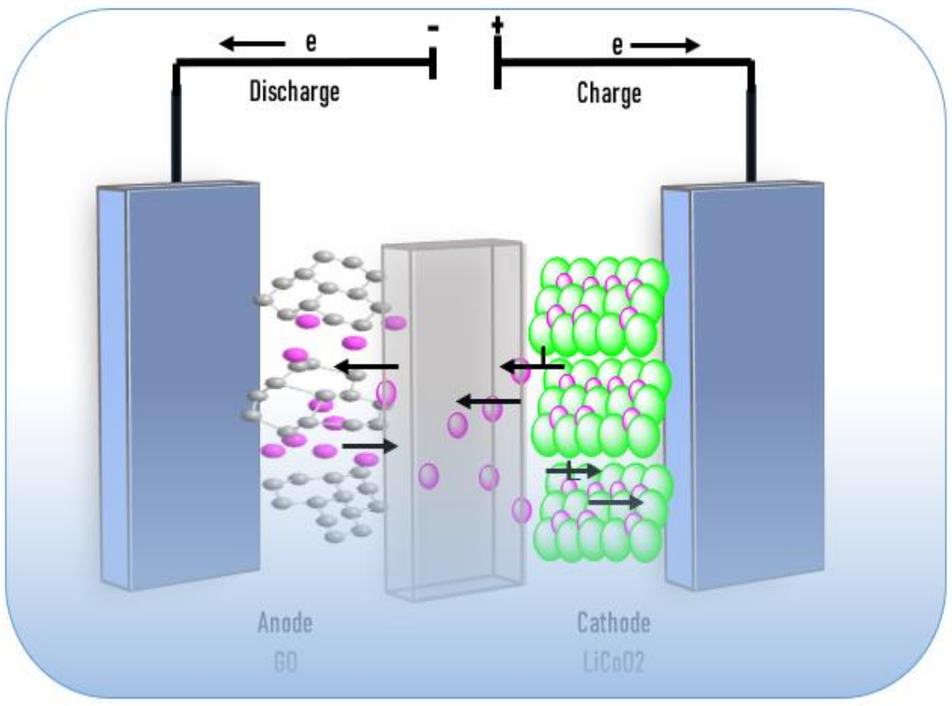
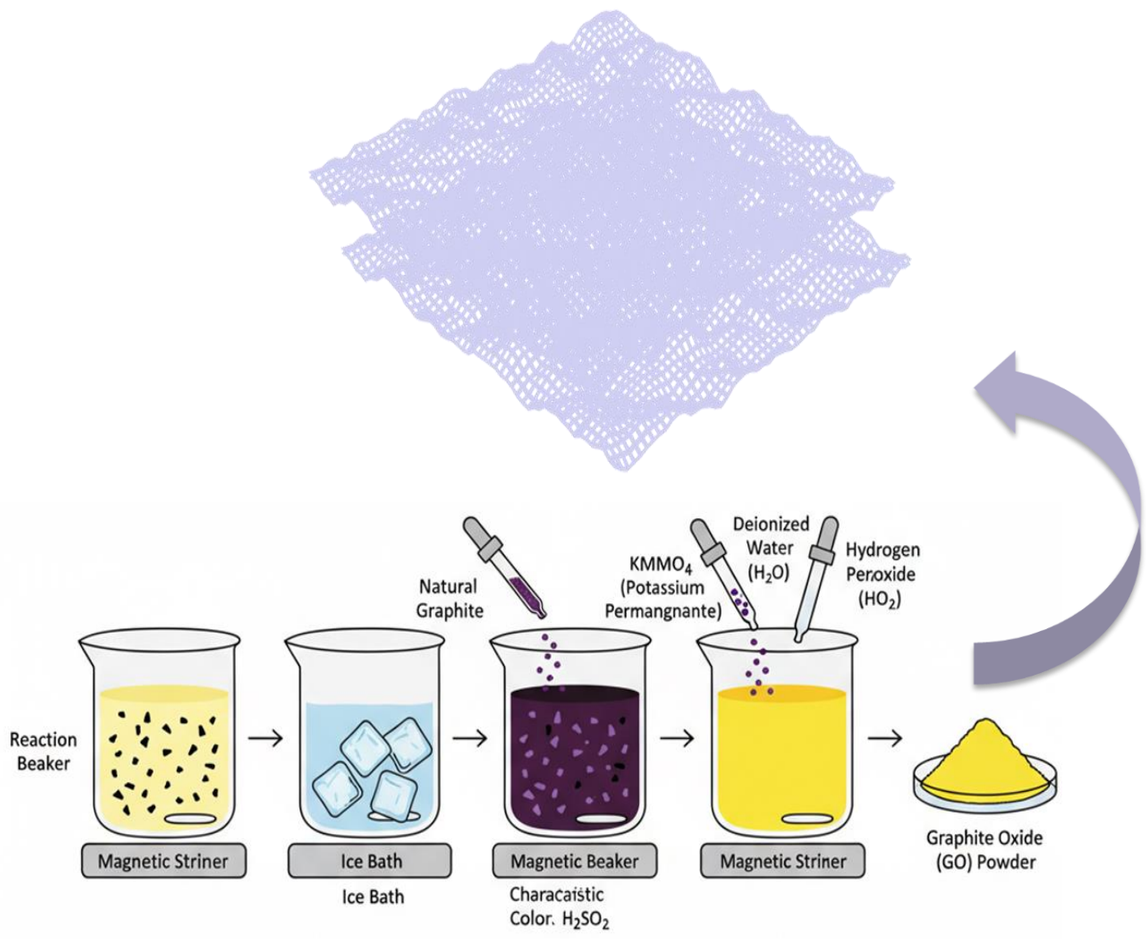
## INTRODUCTION & AIM

The demand for high-performance Lithium-Ion Batteries (LIBs) drives the search for anode materials that surpass the capacity and kinetic limitations of commercial graphite. Graphite Oxide (GO) has emerged as a transformative candidate, offering expanded interlayer channels and a rich surface chemistry that facilitate rapid lithium ion diffusion and higher storage capacity. This study investigates the synthesis of GO via the Modified Hummers' method, employing a multi-technique approach to validate the material's structural evolution **[1]**.

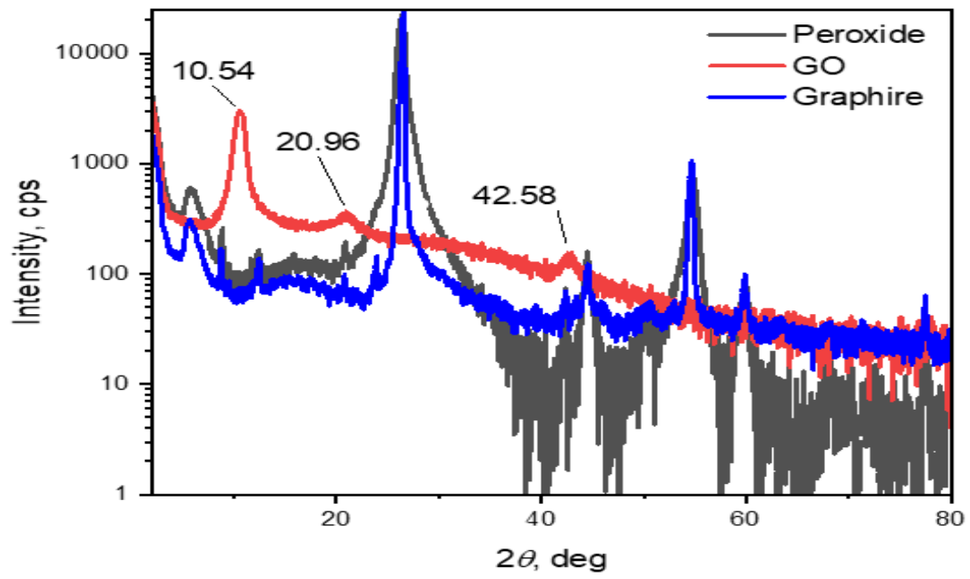



## METHOD




## RESULTS & DISCUSSION

X-ray diffraction (XRD) was employed to monitor the structural evolution and interlayer spacing ($d$-spacing) of the synthesized materials. The diffraction pattern of the pristine **Graphite** precursor revealed a highly ordered structure, characterized by a sharp, intense peak at $\boldsymbol{2\theta = 26.57^{\circ}}$ **(002)** corresponding to a narrow interlayer distance of $\boldsymbol{3.35\mathring{A}\ (0.34nm)}$**.** Upon oxidation via the modified Hummers' method, the **Graphite Oxide (GO)** sample exhibited a complete disappearance of the graphitic **(002)** peak and the emergence of a new, distinct reflection at $\boldsymbol{2\theta = 10.8^{\circ}}$ **(001)**. This significant shift indicates a lattice expansion to $\boldsymbol{d = 8.38\mathring{A}\ (0.84nm)}$, confirming the successful intercalation of oxygen functional groups and water molecules between the carbon layers. In contrast, the **Graphite Peroxide** sample retained a diffraction profile nearly identical to the starting graphite $\boldsymbol{2\theta \approx 26.6^{\circ}}$, suggesting the retention of the original graphitic structure without significant interlayer expansion **[2]**.




## CONCLUSION

This study validates the effective synthesis of Graphite Oxide with a crucial 2.5-fold lattice expansion validated by XRD. This structural opening bypasses the diffusion constraints of conventional graphite, permitting quicker ion kinetics. Consequently, the synthesized GO displays the perfect crystallographic characteristics necessary for high-energy, fast-charging Lithium-Ion Batteries.

## REFERENCES

[1] Koech, A.K. et al. Next Research 2025, 2, 100442

[2] Reshma, R.P. et al. Inorg. Chem. Commun. 2024, 165, 112451.