Experimental Investigation of Nano-Enhanced Thermal Management for Lithium-Ion Batteries Using Immersion Cooling

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ABSTRACT

Lithium-ion batteries have become ubiquitous due to their high energy density, powering devices from smartphones to electric vehicles. However, their performance and safety are compromised by excessive heat generation. This research introduces a novel thermal management system that effectively addresses this challenge. By integrating submersion and nano-enhanced fluids, the system significantly reduces battery temperature, leading to improved performance, extended lifespan, and enhanced safety.

INTRODUCTION

Concise and Informative:

- *Enhancing Lithium-Ion Battery Performance Through Immersion Cooling*

Descriptive and Impactful:

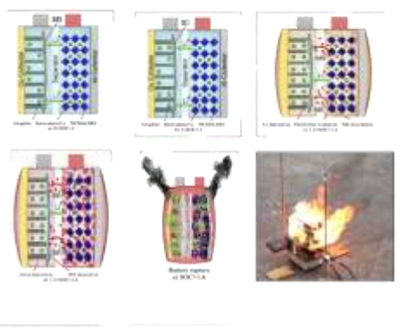
- *Immersion Cooling for Optimal Thermal Management of Lithium-Ion Batteries*
- *The Role of Immersion Cooling in Extending Lithium-Ion Battery Life*

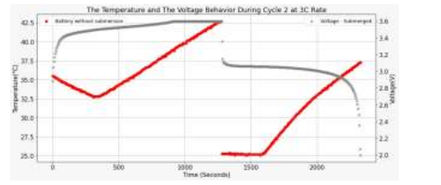
Keyword-Focused:

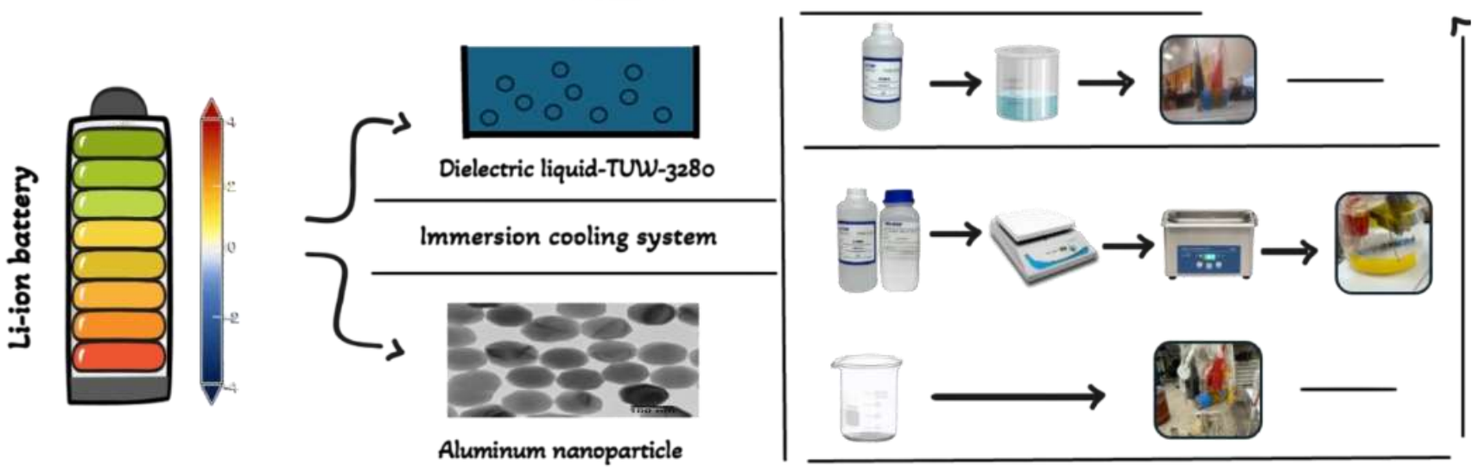
- *Nano-Enhanced Immersion Cooling for Improved Lithium-Ion Battery Performance*
- *Immersion Cooling and Nanoparticle Synergy for Battery Thermal Management*

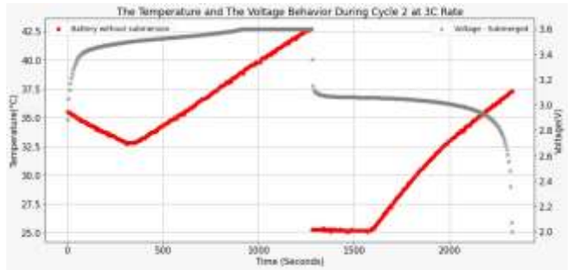
METHOD & RESULT

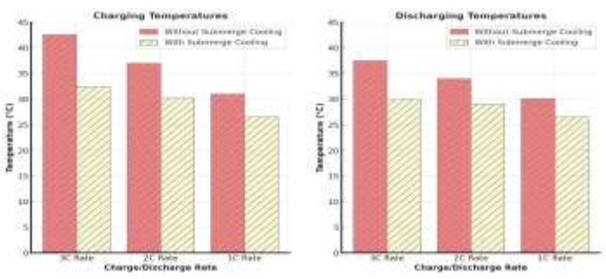
IMMERSION

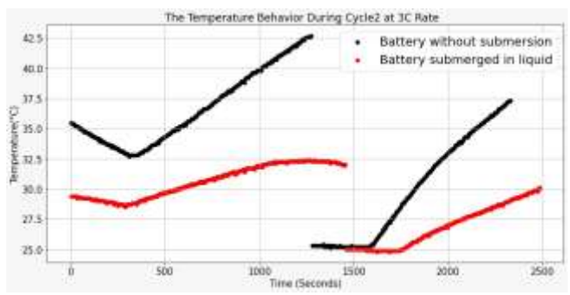


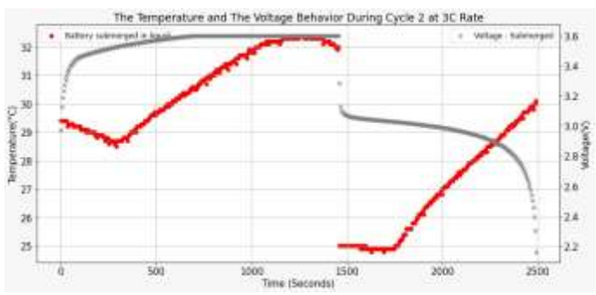












The primary objective of this study is to evaluate the effectiveness of an immersion cooling system in managing the thermal behavior of lithium-ion batteries. Specifically, we aim to:

1. Investigate the impact of immersion cooling on battery temperature stability during charging and discharging cycles.

2. Assess the heat dissipation rates achieved through immersion cooling.

3. Compare the performance of immersion cooling with other cooling methods.

4. Understand the safety implications and potential benefits of using immersion cooling for electric vehicles (EVs) and battery energy storage systems (BESS).

By achieving these objectives, we contribute valuable insights to enhance battery safety, performance, and longevity in practical applications.

Acknowledgements

This research was made possible through the support received from the Enrichment Research Program (Mawhiba) and King Saud University. Their contributions are gratefully acknowledged

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