

# ENHANCED PERFORMANCE OF SRI LANKAN NATURAL GRAPHITE USING PROPANE SULTONE AS AN ELECTROLYTE ADDITIVE IN LITHIUM ION BATTERIES

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Lithium-ion battery (LIB) has become the most important and popular energy source for portable electronics over past two decades due to its high energy density, comparatively high charge/discharge rate and availability in wide temperature range. Current lithium-ion batteries mostly consist of graphite anode and major reasons for using graphite are safety, thermal stability and availability.

Sri Lankan natural graphite (SLNG) has specific physical characteristics like high purity (99.9%), extensive mineralization and high crystallinity. The previous electrochemical results were indicated that SLNG shows a high capacity of lithium intercalation with a better rechargeability.

To enhance the performance of the anode material, special kind of chemical substances are added to the battery electrolyte known as additives. We selected *Propane Sultone* as the additive for SLNG and it was tested using most efficient graphite sample.

Thermal gravimetric analysis, XRD patterns and particle size analysis were done for the all samples of both Bogala and Kahatagaha graphite to select the most efficient type of graphite, for further electrochemical analysis. Then, Scanning electron microscopic image was taken and charge/ discharge cycles at C/3, voltage profiles at (C/3, C/20) and rate performance analysis at ( C/20, C/5, C/2, C, 2C) were done for the selected Bogala graphite. 1M, LiPF<sub>6</sub> cathode material along with propylene carbonate and dimethyl carbonate (1:2) electrolyte were used to do the electrochemical analysis of SLNG. Finally, the anode that was made up with our selected graphite sample was tested with 3% of *Propane Sultone* at 0.3 C rate and the results were recorded and compared with non treated natural graphite anode at the same charge rate.

In this study we will show that the performance of SLNG can be considerably improved by our selected additive and Bogala graphite can be the most promising Sri Lankan graphite type in future modifications of Li- ion batteries.