

DEVELOPMENT OF SRI LANKAN VEIN GRAPHITE FOR LITHIUM-ION RECHARGEABLE BATTERY ANODES BY CHEMICAL OXIDATIVE TREATMENT

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by

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Abstract

Modification of natural graphite has recently moved into the focus of the preparation of anode materials for lithium ion batteries. It has been reported that, modification of natural graphite by oxidation proved a higher reversible capacity around 330 mAh/g, and its cycling behavior is considerable. Reversible intercalation and de-intercalation of Li^+ ions with graphite are attributed to successful formation of a stable and protecting solid electrolyte interface (SEI) on the graphite surface, which is known to complete in initially few cycles.

Recent studies on Sri Lankan natural vein graphite indicate that it has sufficient electrical conductivity to use as potential candidate for Lithium ion rechargeable batteries (Geethika, *et al.*, 2010). Chemical oxidation with acids increases the reversible capacity of Bogala natural vein graphite.

The study aims to chemical oxidation of natural Bogala vein graphite using nitric acid to improve its surface structure. Different structural varieties of natural vein graphite powder were oxidized with series of nitric acid to improve its surface structure. This oxidation process is accompanied by production of nano channels and microspores, which can act as host sites, inlets and outlets for reversible lithium storage. According to the FTIR data, functional groups of carbonyl, carboxyl and hydroxyl groups were appeared after the mild oxidization. Moreover, the attachment of the functional groups represents the removal of active sites. Consequently, the electrochemical performance is markedly improved (Fu *et al* 2006).

The chemical oxidation with HNO_3 slightly modify the graphite surface by forming acidic group which act as surface film to produce SEI resulting high reversible capacity of lithium ion rechargeable batteries. However, chemical oxidation with HNO_3 has not significantly change the d,c electrical conductivity.

Key Words: Surface Modification, Mild oxidation, Solid Electrolyte Interphase