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Mild oxidation of vein graphite for the anode of lithium ion rechargeable batteries

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Graphite has been used as an anode material in the Li-ion rechargeable batteries (LIB). Morphology, surface chemistry and impurities in graphite govern the electrochemical performance of the natural graphite as an anode material. Mild oxidation, which induces acidic group on the graphite surface by thermal and chemical treatments have been identified as a successful method to convert the natural graphite, which is low cost and abundant as anode material in lithium ion rechargeable batteries. The present work investigates the effect of thermal and chemical oxidation followed by surface modification of the vein graphite.

The selected graphite powder was purified prior to the oxidation by acid leaching. Thermal oxidation was performed at 550 ^{0}C in a box furnace under air for six hours. For chemical oxidation, graphite was treated with strong oxidative agents, 69% HNO_3 in air at 60 ^{0}C for 24 hours. Fourier transform infrared (FTIR) spectra of the graphite after thermal and chemical oxidation showed absorption peaks corresponding to $\nu_{C=O}$ stretching around 1740 – 1680 cm^{-1} and ν_{C-O} stretching around 1200 – 1000 cm^{-1} regions, indicating surface modification. It also indicates that the chemical oxidation effectively oxidized the purified graphite surface compared to thermal oxidation. The d.c. electrical conductivity of thermally and chemically treated graphite are around 6.3 – 7.9 Scm^{-1} at room temperature and the oxidation or the surface modifications have not diminished the electrical conductivity of the graphite.

Therefore, this study reveals that vein graphite from Kahatagaha-Kolongala has the potential to be used as the anode of LIB.

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