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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.

Keywords: Anode, mild oxidation, vein graphite

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Student profile of the College of Chemical Sciences, Institute of Chemistry, 2012

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The Institute of Chemistry Ceylon is the largest provider of Graduate Chemists in Sri Lanka since 1996. With the 30th batch passing out it received accreditation from the Royal Society of Chemistry in 2012. The total cumulative output increased to 905 Graduate Chemists. The student population increased from 270 in 2007 to 387 in 2012. Data of the current student population was analyzed *viz*. age, gender, place of residence, employment and students' performance at GCE A/L and O/L examinations. Information was obtained using a questionnaire, from students of all levels including a batch that graduated. 282 responses were received.

78% of students are from the age group 21 to 25 years. Overall female population is 70%. 75% live in the Western Province, followed by 9.9% in the Central Province. The number of students following other educational programmes simultaneously is 59%. Number of students employed shows a drop, from 15.4 to 10.8% compared to the previous year. However, a large number of graduating students have found employment, proving that the Graduateship programme is a well recognized professional qualification. 94.32% have followed the local GCE O/L syllabus and 5.67% have followed the London O/L syllabus. 94% have followed the local GCE A/L syllabus, and 6% have followed the GCE A/L London. Academic performance at GCE A/L - 1 or more A grades 10-12%, no A's just B's & C's only 30-41, no A's or B's, only C's & S's 36-52%, and simple passes only 6-12%. Generally, students who followed the local syllabus have better results at the O/L than at the A/L. The trend is reversed for London syllabus students, as they have comparatively lower grades at the O/L but tend to get more A grades at the A/L. 89% followed biological sciences at A/L. 44% of the students joined the programme after sitting the A/L examination at least twice.

The findings indicate that the programme continues to attract a diverse population of students and has provided a second chance to many who were otherwise deprived of the opportunity to pursue higher studies on account of their performance at the GCE A/L. This programme has also offered the opportunity to university students to complete a chemistry honours programme at least one year earlier than in the traditional universities.

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