LITHIUM ELECTROCHEMICAL INTERCALATION INTO A PARTICULAR TYPE OF NATURAL VEIN GRAPHITE

N.W.B. BALASOORIYA[1], P.W.S.K. BANDARANAYAKE[1] AND PHILIPPE TOUZAIN[2]

[1]*Department of Physics, University of Peradeniya, Peradeniya, Sri Lanka.*
[2]*Laboratoire d'Electrochimie et de Physico-chimie des Matériaux et Interfaces (LEPMI), ENSEEG, INPG, B.P.75, 38402 St.Martin d'Hères, France.*

Sri Lankan natural vein graphite has various morphologies with different structural and physical characteristics. The identified most abundant morphology, the Shiny- Slippery-Fibrous graphite, has a very high purity (up to 98 %). The XRD patterns of samples show a high crystallinity and their d_{002} interlayer distance is about 0.335 nm. The content of the rhombohedral phase for Kahatagaha-Kolongaha shiny-slippery-fibrous graphite (KSSI) leads to a $(101)_R/(101)_H$ intensity ratio, close to 24% .

To investigate the electrochemical intercalation of lithium into untreated and mechanically treated KSSI graphite, coin type cells: metallic lithium | liquid electrolyte | graphite were assembled. The cycleability, discharging and lithium intercalation behavior of untreated KSSI graphite were almost the same for different current rates and electrolyte systems of 1 M $LiClO_4$ or 1 M $LiPF_6$ (in EC/DMC).

Galvanostatic and potentiostatic studies clearly showed that the high irreversible capacity loss of sieve-shaked KSSI graphite [$(101)_R/(101)_H$ intensity ratio, about 22%] was due to exfoliation and passivation. To a large extent, the solid-electrolyte-interface (SEI) films occur inside the sieve-shaked graphite, which hinders lithium accommodation in these sites. The ball-milled KSSI graphite shows a larger extent of $(101)_R/(101)_H$ intensity ratio, about 67%, and more defects with a lower tendency to solvent co-intercalation, no exfoliation and with a better reversible capacity. The results indicate that this type of Sri Lankan natural vein graphite shows a high capacity of lithium intercalation with a better rechargeability.

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