YSCMR 2021

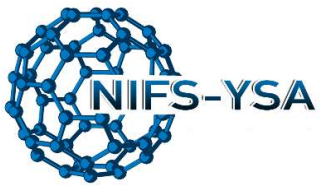
Proceedings of the

Young Scientists' Conference on Multidisciplinary Research - 2021

Virtual International Conference

21st October 2021

"Multidisciplinary Research for Tomorrow's Challenges"



ISSN 2815-0260

Proceedings of the Young Scientists' Conference on Multidisciplinary Research - 2021

21st October 2021

Published by:
Young Scientists' Association (NIFS-YSA),
National Institute of Fundamental Studies,
Hanthana Road, Kandy,
Sri Lanka
www.nifs.ac.lk
Tel: +94 (0) 812 232 002
Email: ysa@nifs.ac.lk

Cover page design & Page setup

Buddhika Karunarathne, Mahesh Senarathna, Hiran Kankanamge

ISSN 2815-0260
Proceedings of the Young Scientists' Conference on Multidisciplinary Research-2021
Young Scientists' Association, National Institute of Fundamental Studies, Sri Lanka
21st October, 2021

Graphite purification: Importance of acid volume by volume percentage for scale-up the acid leaching process

H.M.H.D.K. Naranpanawa[1*], N.W.B. Balasooriya[1,2], T.H.N.G. Amaraweera[1,3], H.W.M.A.C. Wijayasinghe[1]

[1]*National Center for Advanced Battery Research, National Institute of Fundamental Studies, Kandy, Sri Lanka*
[2]*Department of Geology, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Applied Earth Sciences, Uva Wellassa University, Badulla, Sri Lanka*

[*]*himasheedulanjana92@gmail.com*

Background: Laboratory and bench-scale systems are important early-stage tools for assessing and scaling methods prior to industrial-scale pilot plants. The choice of the right scale for the scale-up is crucial when a scale-up is performed and to include scenario analyses for the most important steps before designing the industrial-scale pilot plant.

Objectives: This study aims to find optimum laboratory-level scale-up conditions for graphite purification using Hydrochloric acid.

Methods: Therefore, in the present study, the patented acid leaching purification method was used for scaling-up of purifying vein graphite. Accordingly, two volume by volume (v/v) percentages 10% v/v HCl (HCl-10) and 20% v/v HCl (HCl-20) were investigated. For laboratory-level scaling-up, the arithmetic general formula used both v/v percentages to prepare samples with different weight ratios of graphite:acid.

Results: The Carbon Content (CC) of the raw graphite used for the study was 99.24% and the resultant CC of HCl-10 and HCl-20 samples after initial purification were 99.94% and 99.96%, respectively. Scaled-up samples from both v/v percentages showed slightly different low CC from the initial purified CC. X-ray diffractogram obtained on the purified scaled-up graphite samples show successful elimination of impurities such as pyrite, feldspar, and calcite. Electrochemical characterization was conducted by assembling the anode fabricated from the developed graphite/LiPF6/Li cell configuration with CR 2032-coin cell type. Galvanostatic charge-discharge study revealed the absence of any obvious reversible capacity fading after purification and cycling behaviour was similar to initial purified samples.

Conclusion: The Lithium-ion battery coin cells assembled with HCl-20 graphite sample showed better electrochemical performances than the HCl-10 graphite sample. But, these both samples are showing better electrochemical performances despite the significant volumetric scale-up. Therefore, HCl-10 method can be proposed for further studies in order to minimize the environmental risk in the industrial-scale pilot plant.

Keywords: *Graphite, Purification, Scale-up, Optimization*

Acknowledgement: Financial assistance from General Treasury under a cabinet paper of the Government of Sri Lanka (grant no 17/1907/16/038 on 2017-08-09) is acknowledged.