Abstract No: 154 ***Physical Sciences***

CHARGE-DISCHARGE BEHAVIOUR OF AN IONIC LIQUID GEL POLYMER ELECTROLYTE BASED ZINC/ NATURAL GRAPHITE CELL

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Due to the rapid increase of demand for uninterrupted power, harnessing energy from renewable sources has received a great attention in the twenty first century. To tackle the major issue with renewable energy, which is in continuous unavailability with desired intensity, use of energy storage devices is of utmost importance. Extensive research activities are being carried out to explore energy storage devices with attractive features, such as higher energy density and higher power density. However, their high cost and safety have to be addressed in order to make them attractive for present day concerns on economical and environmental aspects. The main objective of the present study was therefore to fabricate a Zn rechargeable cell having features of low-cost and safety, and to analyse its charge-discharge behavior. As such, zinc and natural graphite electrodes were combined with 1-ethyl-3-methylimidazolium chloride/poly(vinylidene fluoride-co-hexafluoropropylene) gel polymer electrolyte to assemble the cells, and characterization was done using galvanostatic charge-discharge test. Under a constant current of 40 mA, variation of discharge capacity was observed for 1000 cycles using a galvanostat/potentiostat. The initial discharge capacity of the cell was 4.9×10^{-3} mAh which was quickly dropped down to 1.7×10^{-3} mAh. Subsequently, the rate of decrease in discharge capacity was rather slow. However, the cell was able to keep the discharge capacity above 1.0×10^{-3} mAh for 1000 cycles further proving the durability of the device. This cell is identified to be low-cost and safe. With suitable modifications, the performance can be improved further.

Financial assistance from the National Science Foundation, Sri Lanka (Grant No. RG/2017/ BS/02) is acknowledged.

Keywords: Galvanostatic charge-discharge test, Natural graphite, Zn electrodes