Red Seaweed Pulp as a Separator in Rechargeable Al-anode Battery

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SUMMARY
The depletion of non-renewable energy resources, has simultaneously increased the demand for energy storage system like battery. Many efforts have been made to improve the performance of battery such as high concentration of electrolyte, high power density of electrodes and high ion selective separator or membrane. The application of a biomass-derived as a separator have emerged as tantalising alternatives to liquid and synthetic polymer electrolyte for battery. The motivation is clear because of the corrosive, hazardous and leakage of liquid electrolyte usage; non-biodegradable and insolubility of synthetic polymer electrolyte in certain solvents. Due to environmental concern and sustainability, red seaweed-pulp is a good candidate to be used as a separator for battery. The SEM image revealed that morphology of red seaweed consists of 20-30% solid material (endofibre), which consists of small, regular and hollow fibre. These characteristics enable the pulp to absorb and retain the wettability of electrolyte and contribute high ion conductivity of battery. In this study, novel battery, a separator made from red seaweed-pulp, is comprised of aluminium plate (anode), graphite plate (cathode), and sodium chloride (electrolytes) that have been developed. This red seaweed pulp-based battery has shown a very good electrochemical potential from 2.5 to 3.0 V, maximum capacity up to 6 mAh, and the charge-discharge can withstand up to 10 cycles. In summary, red seaweed pulp can be a potential material for energy storage system like battery.

Keywords: Seaweed; Electrolyte; Electrochemical; Charge-discharge; Capacity

1. INTRODUCTION
In recent years, the increasing demand for portable electronic devices and electric vehicles has been a driving force to the expansion of fundamental research of electrochemical energy storage devices including rechargeable battery¹. Rechargeable batteries are devices that can reversibly convert electrical energy into chemical energy and store chemical energy efficiently and subsequently convert back into electrical energy during the applications². Battery systems are presently being improved and developed to meet the requirements of ideal battery and energy storage devices that can give optimum performance at certain operating conditions. The requirement includes energy density, power capability, cycle life, cost, safety issues³. However, the current rechargeable battery still has a limitation to meet the requirement of ideal battery and energy storage devices. This mainly occurs because of the limitation of material properties such as anode, cathode, electrolyte, and separator of the battery.

Nonaqueous battery like lithium ion battery (LIB) and aqueous battery like alkaline, lead-acid and Nickel Metal Hydride (Ni-MH) have received much attention as rechargeable battery due to their promising performance for energy storage devices and large scale power source. There is much attention given to the key materials of both types of battery especially the electrolyte and separator as it is a critical component of a battery.

Liquid electrolytes have high ionic conductivity and have been used widely in the battery system. However, due to some disadvantages such as restriction of battery shape, usage of flammable/volatile electrolyte solvents and the risk of leakage, has restricted the application of liquid electrolyte⁴.

To overcome the limitations, the usage of separator as a substitute has been studied extensively. Battery separator plays two important roles in the battery. (1) Separator is a porous membrane which is used to prevent electric contact to the electrode as it is placed between positive and negative electrode and

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