

# CAPABILITY OF USING ORE MAGNETITE DIRECTLY AS CATHODE MATERIAL FOR SODIUM-ION RECHARGEABLE BATTERIES

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This research was conducted to increase the performance of Sodium-ion (Na-ion) batteries by developing low cost cathode materials using metal oxides. Magnetite ( $\text{Fe}_3\text{O}_4$ ), which is a semiconducting metal oxide which gives good conductivity and capacity to apply in electrodes of sodium-ion batteries. Here in this report, Magnetite ( $\text{Fe}_3\text{O}_4$ ) found from Buththala was used as the cathode material for Na-ion batteries. The Magnetite ore was hammered and then ball milled at 600 rpm. Then this powder that was mixed with carbon black and 5% (w/w) and 5% (w/w) of polyvinylidene fluoride (PVDF) which was dissolved in 1-methyl-2-pyrrolidinon was coated on stainless steel sheet as a thin layer and dried at 100 °C. These films were used to fabricate Na-ion batteries which were then tested in anoxia conditions. Electrochemical properties such as cyclic voltammetry, charge-discharge capacity and impedance analysis were performed. The charge discharge capacity data shows that highest capacity of 8.903 mAhg<sup>-1</sup> and specific energy density 14.45 Whkg<sup>-1</sup> was given by the magnetite with 5% (w/w) of carbon black and the cyclic voltammetry analysis shows that there was no any chemical reaction occurred while charging and discharging. Impedance analysis shows resistance and the capacitance of the two phase of the cell. These data confirmed that magnetite can be applied as cathode material for Na-ion batteries and which need to be further investigated.

**Keywords:** Sodium-ion, Magnetite,  $\text{Fe}_3\text{O}_4$ , Cathode, rechargeable batteries.

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