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Electrochemical Study of Al-Doped K_2CO_3 Activated Coconut Husk Carbon-Based Composite Anode Material for Battery Applications

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Abstract : The Composites of Al-Doped K_2CO_3 activated coconut husk carbon; $Al_{0.1}:(K_2CO_3C)_{0.9}$ and $AI_{0.3}:(K_2CO_3C)_{0.7}$, were prepared using the hydrothermal method and drop casting deposition technique. The electrochemical performance of the Al-doped K_2CO_3 activated coconut husk carbon composite as a promising anode material for lithium-ion batteries was characterised by cyclic voltammetry analysis, electrochemical impedance spectroscopy and galvanostatic charge discharge analysis. The anodes' material exhibited an irreversible capacity loss, which can be primarily linked to the reverse reactions inside the solid electrolyte interface formation, aluminium adsorption in the conducting carbon black additive, and the electrolyte's irreversible electrochemical breakdown. The charges that are retained in the anode material during charging showed a linear decline in charge capacity as charging current intensity increased. Ionic polarisation was the reason for the observed drop in the charge and discharge capabilities at the current density of 5 A/g. Having greater specific capacitance and energy density, the composite $Al_{0.1}:(K_2CO_3C)_{0.9}$, is a better anode material for electrochemical applications compared to $AI_{0.3}:(K_2CO_3C)_{0.7}$, also its comparatively higher power density at a scan rate of 5 mV/s is mostly explained by its lower equivalent series resistance.

Keywords : coconut carbon husk, power density, energy density, battery, anode electrode
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