University of Utah
UNDERGRADUATE RESEARCH JOURNAL

FLASH PYROLYSIS OF COAL CHAR FOR SODIUM-ION BATTERIES

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One great obstacle in creating a world where renewable energy is our primary source of power is efficiently storing the energy harvested from renewable sources. Advancing battery technology is pivotal in making renewable energy a sustainable alternative to current energy production methods. The problems with commonly used lithium-ion batteries are that they are expensive and limited in resources. Sodium-ion batteries (SIBs) provide a promising alternative because they are more cost effective and materially abundant. Due to elemental differences between sodium and lithium, sodium ions batteries are yet to perform as well as LIBs. The goal of our research is to develop competitively performing sodium-ion batteries using widely abundant coal char as the hard carbon anode material to lower cost per kWh of energy storage. Coal char's performance in batteries can be improved upon by manufacturing a highly porous carbon structure. Increasing the porosity of the coal char increases the surface area on the coal char particles which improves the energy storage potential within a battery. One way this can be done is by using flash pyrolysis to rapidly heat the coal. Flash pyrolyzing coal char particles (75-90 μm) at a heating rate of approximately (1400 K/s) to 900 C burns off unwanted volatile material leaving behind highly porous char due to rapid expansion. In three-electrode test cells, the flash pyrolyzed coal char electrodes show a low initial capacitance followed by an increase in capacitance in subsequent cyclic voltammetry tests. Which suggests that more testing needs to be done in order to confirm results and fully understand the properties of the flash pyrolyzed coal as an anode material.