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Influence of $K_3Fe(CN)_6$ on the electrochemical performance of carbon derived from waste tyres by K_2CO_3 activation

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ABSTRACT:

Revalorisation of waste tyres to sustainable value added carbons was studied as a possible means of addressing the challenges with rising demand for energy across the globe. Crumble tyres were used for the production of activated carbon (AC) in the presence of potassium carbonate (K_2CO_3) salt as the activating agent. The activated carbon (AC) materials exhibited predominantly mesoporous framework with specific surface area between 147 and 385m^2 g^{-1}. Fabricated electrodes from these AC materials displayed a discharge capacity of 50 mAh g^{-1} at 0.25 A g^{-1} in a redox-mediated electrolyte of 1M$K_3Fe(CN)_6$-1M HNO_3 corresponding to a specific capacitance of 140 F g^{-1} at the same specific current, with an energy efficiency of 70% after 1000 cycles. The enhanced electrochemical performance of the electrode is due to a coupling electrolyte additive, which offers an alternative approach for the design of an efficient electrochemical energy storage device.