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Investigating the Influence of Potassium Ion Doping on Lithium-Ion Battery Performance

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Abstract : This nanotechnology study focuses on how potassium ions (K+) affect lithium-ion (Li-ion) battery performance. By adding potassium ions (K+) to the lithium tin oxide (LiSnO) anode and employing styrene-butadiene rubber (SBR) as a binder, the doping of K+ was specifically studied. The methods employed in this study include computer modeling and simulation, material fabrication, and electrochemical characterization. The potassium ions (Li+) were successfully doped into the LiSnO lattice during charge/discharge cycles, which increased the lithium-ion diffusivity and electrical conductivity within the anode. However, it was found that internal doping of potassium ions (K+) into the LiSnO lattice occurred at high potassium ion concentrations (>16.6%), which hampered lithium ion transfer because of repulsion and physical blockage. The electrochemical efficiency of lithium-ion batteries was improved by this comprehensive study's presentation of potassium ions' (K+) potential advantages when present in the appropriate concentrations in electrode materials.

Keywords : lithium-ion battery, LiSnO anode, potassium doping, lithium-ion diffusivity, electronic conductivity
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