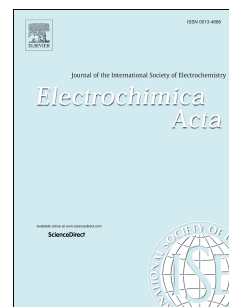


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Solvothermal synthesis and electrochemical properties of $\text{Na}_2\text{CoSiO}_4$ and $\text{Na}_2\text{CoSiO}_4$ /carbon nanotube cathode materials for sodium-ion batteries

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Abstract:

The commercialization of large-scale energy storage systems has renewed the scientific interest on electrode materials for sodium-ion batteries (SIBs). Polyanionic sodium orthosilicates [$\text{Na}_2\text{M}(\text{SiO}_4)$] are an interesting group of SIB cathode materials with high redox potentials *via* a two-electron redox process, and their three-dimensional framework. However, studies on these materials are limited due to difficulties in synthesizing them in stable and electrochemically desirable phase. Exhibiting rich polymorphism, orthosilicates undergo irreversible structural changes during processing and/or cycling. Here, we report a solvothermal process, which yields *in situ* carbon-coated $\text{Na}_2\text{CoSiO}_4$ with monoclinic structure. Besides physical characterization, we discuss its electrochemical performance in coin-cell configuration vs. Na anode. $\text{Na}_2\text{CoSiO}_4$ exhibits significantly lower polarization (0.15 V) than $\text{Na}_2\text{FeSiO}_4$ and $\text{Na}_2\text{MnSiO}_4$. As polyanionic compounds are poor electronic conductors with sluggish redox kinetics, we observe that these limitations could be overcome in $\text{Na}_2\text{CoSiO}_4$ by incorporating functionalized multi-walled carbon nanotubes (MWCNTs). The $\text{Na}_2\text{CoSiO}_4$ /MWCNT composite cathode reversibly

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