A study of Cu-doping effects in $Na_2Mn_3O_7$ layered cathode material for Sodium-ion battery

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In recent years, sodium-ion batteries (SIBs) attracted great attention owing to their rich Earth-abundant resources, environmental friendliness, low cost, and high energy efficiency. To be compared to lithium-ion batteries the developing advanced cathodes play a key role in enhancing the performance of SIBs. Layered transition metal oxides NaxMO2 (M = Co, Mn, Fe, Ni, etc.) are one of the promising cathodes for SIBs due to the variable composition, abundant active center, and good electrochemical performance. Among these layered transition metal oxides, layered manganese oxide-based materials have been attracted because of the nontoxicity of manganese, economical price of precursors, and high capacity. Metal atom doping was extensively studied in layered cathodes for the purpose of enhancing the performance of SIBs. By means of doping can result in improvement of structure stability and capacity retention.

This research investigates developing Cu-substituted P1-type Na2Mn3O7 in order to improve electrochemical performance. The Cu-substituted Na2Mn3O7 was synthesized via the solid-state method in an oxygen atmosphere. The XRD, SEM, TEM, and electrochemical studies were employed to systematically investigate crystal structure, surface morphology, and cyclability.

Acknowledgment

This work was supported by the Ministry of Education and Science of the Republic of Kazakhstan Grant (AP08856179), "Boosting the electrochemical performance of the cathode material for beyond lithium-ion batteries" and by the Nazarbayev University Faculty-development competitive research grant (080420FD1914) "Rational design of new anionic-redox based active material for rechargeable sodium-ion batteries"