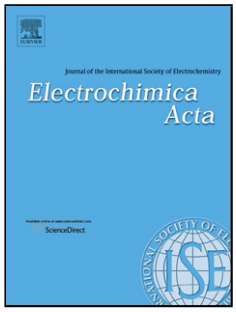

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Study on the stability of Li_2MnSiO_4 cathode material in different electrolyte systems for Li-ion batteries

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Abstract

This study reports on the thorough investigation into the interaction between nanosized carbon-coated Li_2MnSiO_4 and various electrolytes, which has revealed significant changes of the active material after soaking in the electrolyte. Apart from the standard electrolyte salt lithium hexafluorophosphate ($LiPF_6$), lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) and the F-free salt lithium bis-oxalatoborate (LiBOB) were used for soaking tests and compared in terms of corrosion power with Li_2MnSiO_4. Carbon-coated Li_2MnSiO_4 samples were obtained by solid-state synthesis and stored in contact with the electrolyte. The aged samples were fully characterized by means of several analytical techniques (XRD, XPS, SEM, ATR-FTIR). The results show that Li_2MnSiO_4 decomposes in $LiPF_6$-based electrolyte at high temperatures, due to the formation of HF, which causes corrosion of the material and dissolution of Mn. No degradation was observed after soaking in the LiBOB-based electrolyte. The corrosion of the active material in standard electrolyte system, together with irreversible structural changes upon Li electrochemical extraction, are considered as the main reasons for the poor capacity retention upon cycling of the Li_2MnSiO_4-based cathode.