Characterization of Lithium ion cathodes interfaces with different liquid ions by DC and AC techniques

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The composite electrodes in Li-ion batteries are one of the pathways to improve the behavior of this type of devices. The transition metal oxides have been studied as electrode materials for rechargeable lithium-ion batteries because of their high theoretical capacity, but its potential applications are limited due to its poor electrical conductivity. So, add a conductive material, as carbon, can be an option not only to improve these deficiencies in terms of electrical conductivity also in the surface area. The combination of faradaic reaction from Lithium compounds and capacitance from carbon materials can be utilize to improve the performance of electrochemical devices. Among transition metal oxides, manganese oxide ($LiMnPO_4$) has been studied as an electrode for lithium batteries with a high storage capacity. The composite cathodes with a manganese oxide and conductive phase, as multi-walled carbon nanotubes, will lead to obtain a cathode with a synergistic effect, where are combine the physical properties of both.

The composite electrode with different conductive phase ratios was studied by Electrochemical Impedance Spectroscopy (EIS) and Cyclic Voltammetry (CV). Two different anode/electrolyte and cathode/electrolyte systems based on liquid lithium ions, such as 1 ethyl Methyl Imidazolium triflate and Trifluormethane Li was characterized. Each formed interfaces are characterized by EIS with different frequency ranges in potential region of interest. Morphological characterization of the composite electrode, reveal the effect of the multi-walled carbon nanotubes; the results was compared between Localized Electrochemical Impedance Spectroscopy and the 3D mapping, with the magnitude obtained from the half-cell experiments.