Ionically Enhanced Silicon Nano Alloy Anode Enabled by $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ Solid State Electrolyte

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This study reports a Silicon (Si) nanoalloy composite anode enabled by $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$ Solid State Electrolyte to enhance its ionic conductivity. Si is one of the most promising anode material candidate with the potential to meet the increasing demands of high energy and power for the next generation lithium ion batteries. However, Si-based anodes suffer from capacity fading and poor initial cycle efficiency due to its intrinsic material properties. Herein we propose an ionically enhanced Si nanoalloy composite material with one of the popular solid-state electrolytes $Li_{1.3}Al_{0.3}Ti_{1.7}(PO_4)_3$, rather than carbonaceous based electrical conducting additives. We believe that this novel concept is not only enhancing Si electrode's ionic property along with reducing lithium loss due to continuous SEI (Solid Electrolyte Interface) growth over the cycling and also improve lithium diffusion at higher current rate.

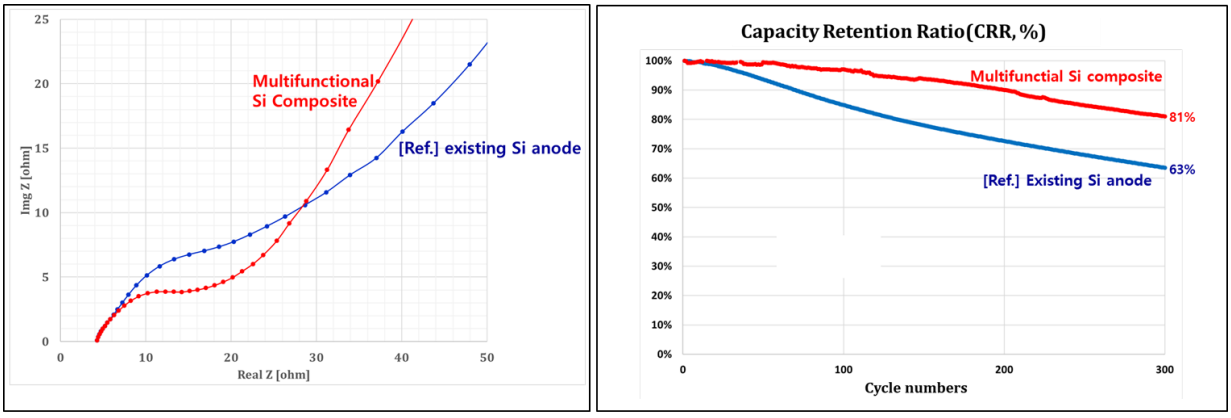

Figure 1. (a) Electrochemical Impedance Spectroscopy(EIS), (b) Full Cell Cycle Performance