SiO_2/ PVDF coated separator with enhanced thermal stability for Lithium–ion rechargeable batteries

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Lithium-ion battery performance depends mainly on the selection of electrodes, electrolyte and separator used. Separator, an ion permeable micro-porous material is a key constituent to restrain undesirable crumple; its most important function is to sustain physical separation between the cathode and the anode. Before a membrane can qualify as a separator for a lithium-ion rechargeable battery, several properties such as porosity, pore-size distribution, thickness, thermal stability and mechanical properties have to be optimised. Here we had verified a simplistic approach to appreciably enhance the thermal stability of the fabricated composite separator. This composite separator is acquired by coating both sides of the PE separator uniformly with SiO_2 nano particles dispersed in PVDF/NMP mixture. The SiO_2/ PVDF ratio is optimised for consistent distribution. The inorganic fillers are regularly spread over the membrane matrix which is confirmed by EDX mapping of Si. Fabricated membranes show excellent miscibility with the liquid electrolyte which is desirable for developing better Lithium ion rechargeable batteries. Shrinkage test was done to observe the dimensional change in the sample by placing it in vacuum oven at 150ºC for 1 hour. The results corroborate that, the separator fabricated with optimum SiO_2/ PVDF ratio shows very less percentage Shrinkage (~3 %). Following few additional characterizations for the fabricated separator the coin cell is fabricated in argon filled glove-box very carefully. The fabricated composite separator shows good electrochemical performance and stability.

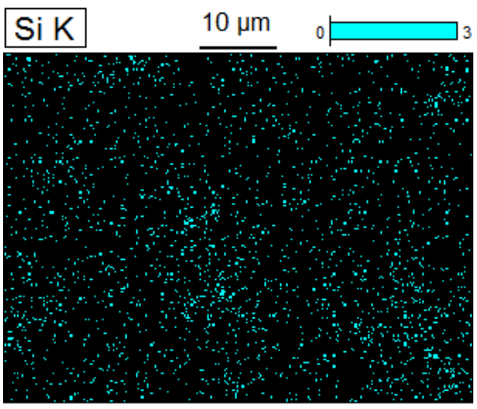

Figure 1. EDX mapping of Si element for composite separator

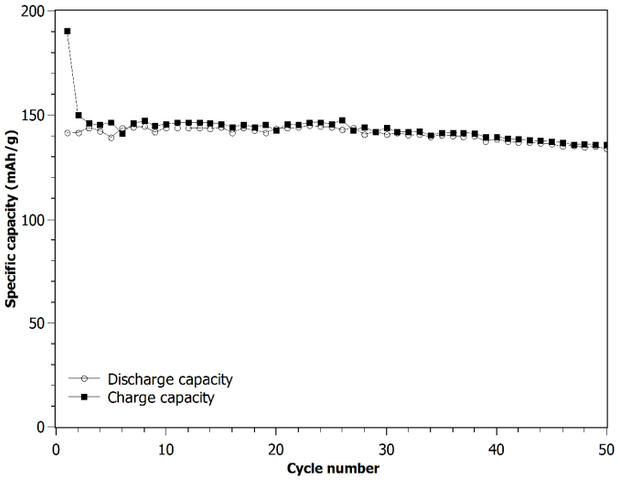

Figure 2. Charge/ discharge profile of lithium half cell with composite coated PE separator

References

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