# Method of Depositing Lithium Metal and Its Current Collector for Solid State Batteries

K. Prashanth Kumar [1], Thulasi Raman K.H. [2], Divya Bharathi M S. [1], Balasundaraprabhu R. [1], Mohan Rao G. [2], Prasanna.S.[1]

*[1]Thin Film Center, Department of Physics, PSG College of Technology, Coimbatore, India*
*[2]Department of Instrumentation & Applied Physics, Indian Institute of Science (IISc), Bangalore, India*
*Email: iapkumar17@gmail.com*

## Abstract

Lithium metal was deposited using specially designed compact thermal evaporation source and the deposition source can produce uniform lithium thin film on a four-inch wafer. Lithium deposition in solid-state electrolyte battery was performed with optimum metal weight using trial and error method. More than 3-micron thickness Lithium thin film was de-laminated after the Cu current collector deposition on to the lithium metal and the de-lamination could be stress induced de-lamination and poor interfacial adhesion with LiPON(Lithium phosphorus oxynitride) solid-state electrolyte. To avoid de-lamination of lithium from the LiPON solid-state electrolyte surface, we have optimized the lithium to copper thickness with different quantities of Cu and Li. We found that 1gm of Cu and 0.3gm of lithium was optimized as a suitable window for the right performance of the solid-state battery. Lithium stability with LiPON solid-state electrolyte was carried using cyclic voltammetry. The cyclability of lithium with the cathode and other anode materials were performed and it has shown stable performance for longer cycles. Time-dependent Lithium stability with LiPON interface and Copper as capping layer was evaluated and lithium metallic color was stable for 25 days or more for LCE 2 condition.