Investigation of Materials in Solid State Thin Film Lithium Ion Batteries

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Abstract:

In the field of autonomous systems, microbatteries have become ubiquitous with the growth of portable consumer electronic devices like mobile phones and laptop computers. Thin Film Lithium Ion batteries are one solution for autonomous systems and have led to investigation of novel materials for anodes, cathodes and electrolytes. In recent years, much work has gone into the investigation of cathode materials with high cyclability and energy capacity. Additional time has been invested in finding electrolytes with high ionic conductivity so that lithium ions have high mobility while in operation. The novel methods that our research brings to the microbattery world are the use of a sputtering device for microfabrication and integration of new materials. By finding the optimal conditions with which each new material is deposited, the energy capacity of our batteries can be improved significantly and programmable battery arrays can be created. The motivation for our research is to develop microbatteries that are energy harvesters, as well as energy storage devices. By designing and building a rechargeable thin film lithium ion battery with high cyclability and energy capacity, our research lays the foundation for investigation of thermogalvanic batteries, batteries that harvest energy from thermal gradients; a crucial step towards more efficient microbatteries.