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Fabrication and Characterization of the Thin Film Solid State Li-Ion Batteries

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Solid-state lithium-ion batteries are recognized as the emerging battery technology of choice for electronics that store electrical energy, providing greater safety and compactness compared to standard lithium-ion batteries. The latter contains a liquid electrolyte, which leads to more leakages and other dangers. The advantages provide benefits to the emerging battery technology. The chances of leakage are reduced and there is less risk of burning.

We focused on a strong fabrication and measurement process for the materials for a thin-film solid-state lithium-ion battery. The battery materials used were LiCoO_2 as the cathode, LiPON as the solid electrolyte, Sn as the anode, and a stack of these materials as a single entity in a film format placed on silicon substrates utilizing electron-beam evaporation. The films were also annealed at 50°C, 100°C, and 150°C for one hour each with an unannealed set used as reference to analyze the effects of annealing.

To evaluate how annealing affected battery behavior, we used a Van der Pauw measurement system analyzing electrical parameters: resistivity, sheet resistance, mobility, carrier density, and Hall coefficient. These measurements were complemented by current–voltage (I–V) characterization for each material and the multilayer stack. Findings will be presented during the meeting.

Academic or Professional Status

Undergraduate Student

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