Abstract: Fabricating Solid-State Batteries for Electric Aviation

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All-solid-state lithium batteries are widely reputed as the next major step in energy storage technology on account their drastically improved safety over wet cells, as solid electrolytes lack the volatile compounds in wet electrolytes that make them combustible. This enhanced safety enables a far wider range of products and vehicles to go fully electric and aligns with future NASA missions that require high performing, reliable, and safe batteries. However, they currently face issues with implementation in consumer products due to the often-poor mechanical properties of the solid electrolyte and relative difficulty to manufacture [1].

Typical solid-state electrolyte challenges were bypassed by incorporating a range of polymeric binders into a solid electrolyte suspension and cast onto a composite carbon-sulfide cathode to create a single bilayer film. The resulting films display superior flexibility and durability compared to solid-electrolyte films typically discussed in literature without compromising the thinness of the films. The bilayer film was then punched into 12.7 cm diameter discs and 4 cm by 5 cm sheets, pressed, and assembled into coin cells and pouch cells respectively.

[1] Donald A. Dornbusch, Rocco P. Viggiano, John W. Connell, Yi Lin, Vadim F. Lvovich. Practical considerations in designing solid state Li-S cells for electric aviation, Electrochimica Acta, 2021, 139406, ISSN 0013-4686, https://doi.org/10.1016/j.electacta.2021.139406.