Summer 8-7-2020

Advanced Solid-State Lithium Batteries for Electric Vehicles

Yelsin Mendez Camacho

ADVANCED SOLID-STATE LITHIUM BATTERIESFOR ELECTRIC VEHICLES

Mendez Yelsin
English Language Institute- Syracuse University

ABSTRACT

Solid-state lithium batteries (SSLBs) may have the potential to safe and long-distance driving in electric-vehicles (EV) (Long, Xiaoming, Zhiming, & Li-Zhen, 2021). However, manufacturing processes and new materials need to be developed to make these batteries commercially available.

INTRODUCTION

The EV market demands low-cost, environmentally friendly, high power density, long cycle life, and fast recharging batteries. SSLBs are emerging as a promising choice due to high safety standards, low cost, and high capacity; however, there are still some challenges related to advanced materials and manufacturing processes that need to be solved (Xinyou, Yan, Guofeng, & Chris, 2020).

Solid-State Lithium Batteries SSLBs vs. Traditional Lithium-ion Batteries LiBs

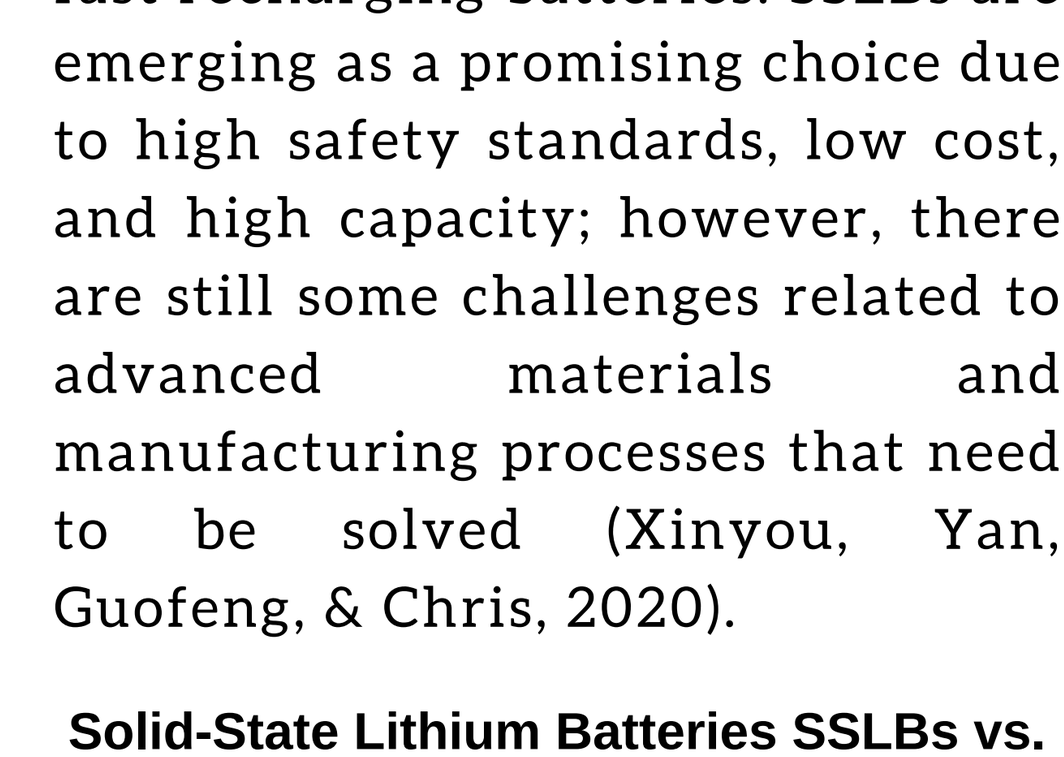

Figure 1. (a) Conventional lithium-ion battery and (b) Solid-state lithium-ion battery (Fuminori, Chihiro, & Hideki, 2014)

Table 1. Benefits of SSLBs and drawbacks of LiBs (Hang Chao, Xin, Wen, & Xiaoming, 2019)

SSLBs	LiBs
- Powerful batteries without extra space - Long cycle life - Charge faster	- Cause accidents - Require weighty cooling systems - Suffer electrode corrosion

Solid-State Lithium Battery Challenges

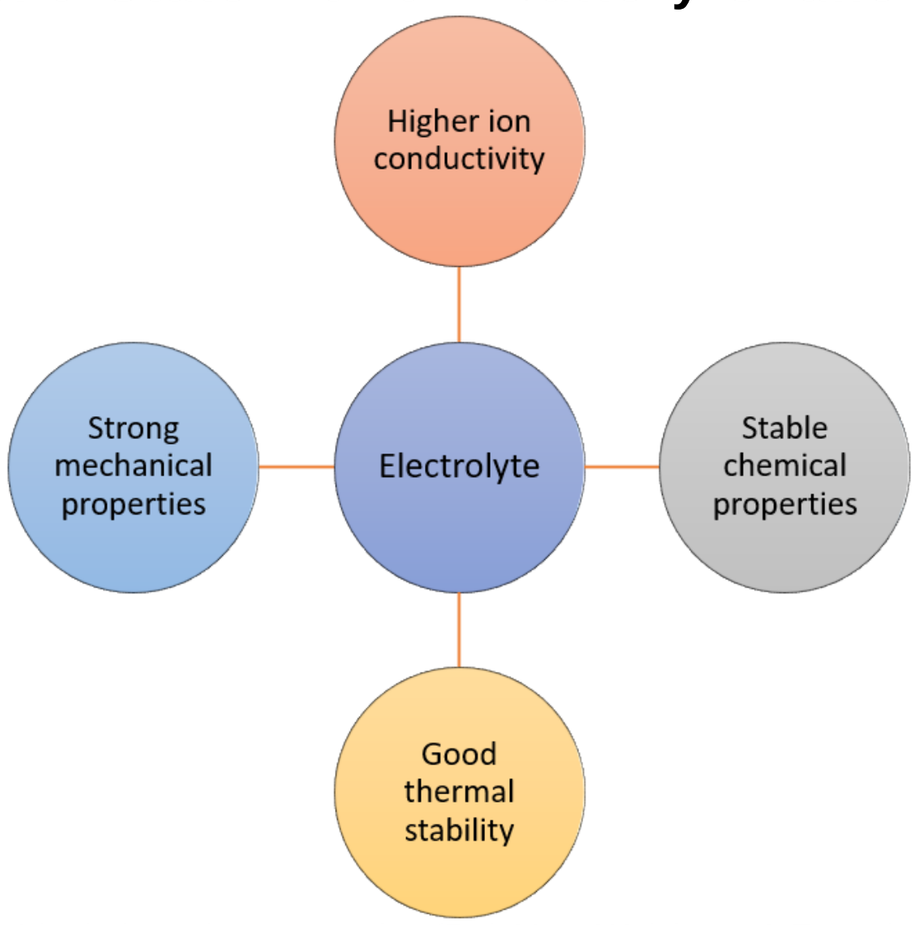

Figure 2. Ideal electrolyte properties (Rui, Yue, Weixiang, & Fengchun, 2020)

CONCLUSIONS

-SSLBs could become the power source for EV thanks to their enhanced safety standards, increased energy storage capacity, and improved long cycle life.

- New electrolytes and manufacturing processes must be improved to meet SSLBs expectations.

REFERENCES

- Long, C., Xiaoming, Q., Zhiming, B., & Li-Zhen, F. (2021). Enhancing interfacial stability in solid-state lithium batteries with polymer/garnet solid electrolyte and composite cathode ramework. *Journal of Energy Chemistry*, *52*, *210-217.*
- Xinyou, K., Yan, W., Guofeng, R., & Chris, Y. (2020). Towards rational mechanical design of inorganic solid electrolytes for all-solid-state lithium ion batteries. *Energy Storage Materials, 26, 313-324. https://doi.org/10.1016/j.ensm.2019.08.029*
- AFuminori, M., Chihiro, Y., & Hideki, I. (2014). *Lithium-Ion Batteries: 12 - Solid-State Lithium-Ion Batteries for Electric Vehicles.* El sevier.
- Wang H, Cao X, Liu W and Sun X (2019) Research Progress of the Solid State Lithium-Sulfur Batteries. Front. *Energy Res. 7:112*. doi: 10.3389/fenrg.2019.00112
- Rui, X., Yue, P., Weixiang, S., & Fengchun, S. (2020). Lithium-ion battery aging mechanisms and diagnosis method for automotive applications: Recent advances and perspectives. *Renewable and Sustainable Energy Reviews, 131, 110048. https://doi.org/10.1016/j.rser.2020.110048*