Novel Sodium-Nickel-Chloride Technology Provides Energy Storage Alternative

Marisa Ngbemeneh, 6 May 2020

As of April this year, LiNa Energy successfully demonstrated proof-of-concept for the large-scale manufacture of a novel sodium-nickel-chloride battery.[1] The project, a collaboration with the University of Lancaster and innovation centre CPI, centers on the development of a highly recyclable, low-cost battery which is notably manufactured without cobalt or lithium—both of which are key elements in (aptly-named) lithium-cobalt ion batteries, the current gold standard for battery technology. Particularly in recent years, efforts have been made to move away from lithium-cobalt batteries due to globally increasing costs of cobalt, safety concerns, and limitations on operating temperatures (i.e. $<60°C$). In light of this, the LiNa battery presents several key advantages: low-cost scalability, safer operation, more compact size, and high performance in a wider range of operating temperatures than the alternative.[1,2] While the technology is novel and still has a ways to go before it achieves adoption comparable to that of lithium-cobalt ion batteries, the project's proof-of-concept for the viable production and operation of this technology is promising.

The implications of this project are connected to our findings in the solar fuel cell experiment. While the first part our investigation focused on the efficiency and optimization of a solar fuel cell itself, the second was concerned with determining the capacity of a fuel cell system to meet a given energy load (300 kWh) over a two-year period. Due to the low efficiency of the fuel cell, we found that it was *not* able to meet this load, necessitating the additional storage of hydrogen as fuel. Effective energy storage is crucial for addressing rising energy demand in the near future, and much research has been done to (1) improve the overall capacity of energy storage alternatives, and (2) determine the respective advantages of each (i.e. hydrogen vs. batteries). Literature findings indicate that the round-trip efficiency of certain energy storage systems—like the regenerative hydrogen fuel cell (RHFC) system in *Pellow, et al.*—can be significantly lower than the overall energy efficiency for lithium ion batteries, which typically ranges from 75-90%.[3] In the case that efficiency for hydrogen fuel cells does *not* dramatically increase, the LiNa battery might serve as a viable energy storage alternative to hydrogen—in our experiment, as well as in industry.

In either case, the LiNa project demonstrates exciting progress in the field of energy storage. With further development, it has the potential to lead the shift from fossil fuels to renewable energy sources, particularly in the automotive and power grid industries.[2] Doing so would represent a cost-effective and more sustainable way to address globally increasing energy demand, which gives us all the more reason to hope for the continued success of this project!

References

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3. Pellow, et al. "Hydrogen or batteries for grid storage? A net energy analysis." *Journal of Energy and Environmental Science* 8.7 (2015): 1938-1952.