1-1-2021

Smart Nails for Lithium-ion Battery Safety Characterization

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Proposal Identifier: RCEU21-MAE-GZ-01

Project description

Li-ion batteries have been widely used in consumer electronics, electric vehicles and renewable energy storage. But under abuse conditions such as being penetrated by sharp objects during vehicle crash, they may go to thermal runway with fire or even explosion. The objective of this project is to develop smart nails for triggering and characterizing thermal runaway of lithium-ion batteries. A prototype of smart nail has been developed and used in our recent publication, "Understanding Li-Ion Cell Internal Short Circuit and Thermal Runaway through Small, Slow and In Situ Sensing Nail Penetration" in *Journal of The Electrochemical Society* (https://iopscience.iop.org/article/10.1149/1945-7111/ab8878/meta). This project will build on our initial efforts by further developing smart nails with embedded sensors.

Student Duties, Contributions, and Outcomes

The student will assist the PI (Dr. Zhang) and a graduate student in designing in designing and machining smart nails with embedded sensors. The nails will be used to trigger and characterize lithium-ion battery thermal runaway. The student is expected to learn the principles of previous

prototypes and discussing new designs. The student will be responsible for machining new smart nails. The student is also expected to perform experiments with graduate student.

Student Selection Criteria

You will learn lithium-ion batteries by doing experiments with graduate students and attending weekly research group meetings. You will have opportunity to be co-author of research publications depending on your contribution and the project progress. Preference will be given to applicants who have experiences of CAD (e.g. SolidEdge) and machining.

Faculty Mentorship

The PI will directly mentor the student through weekly group meetings. The student will present weekly project update and get feedback. The student will also be directly mentored by an experienced graduate student. The student will have opportunity to be co-author of research publications depending on contribution and the project progress.