

Novel electrolyte additives for extended cycle life of Li-ion cells operating at wide temperature range

Proposition #1: Development of nitrogen-based additives for extended cycle life of Li-ion batteries operating at wide temperature range

SAFT is the first designer, developer and producer of high technology batteries for industry and defense applications.

SAFT is looking for novel and innovative electrolyte chemistries for its own systems that would allow lithium-ion batteries to operate at wide temperature range, ideally from -40°C up to 60°C , with extended cycle life. Based upon battery specifications, the applicant will investigate potential nitrogen-based molecules to be added in the baseline electrolyte. N-derivative compounds have been already more or less implemented successfully into battery electrolytes for enhanced performance at elevated temperature, when LiPF_6 is employed as the main salt in the electrolyte. These Lewis bases might stabilize the bulk electrolyte from potential thermal decomposition and provide excellent cycle life thanks to good passivation properties of the electrodes.

In the proposed internship, the applicant will conduct a bibliographical study to select possible N-compounds of interest, and propose three ligands to be tested in cells. The applicant will be then able to build lithium-ion cells in order to define what additive needs to be further investigated or not. Depending on the results the intern will collect, the later should be capable of explaining why the additive is working or not, and then suggest additive modifications that would be required to ameliorate battery performance.

Keywords: Lithium-ion batteries, electrolyte, additives, nitrogen

Techniques: Electrochemical means of characterization (galvanostatic and potentiostatic methods, impedance spectroscopy), NMR (^{31}P , ^{19}F , ^{13}C , ^1H)

Applicant's profile: 2nd or 3rd year in an engineering school program or 1st or 2nd year in a Master's degree program. Strong background in electrochemistry and basics

in organic chemistry are required. This is a 6 (or 4)-month internship that may start March 1st, 2017.

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