

Electrolytes: A key component for improved safety and longer life of lithium ion batteries

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LiPF₆ based non-aqueous organic carbonate solvent based electrolytes solutions are the state-of-the-art in lithium ion batteries. With the help of various, to most part novel analytical techniques, qualitative and quantitative information of the electrolyte degradation products could be gathered and eventually resulted in the proposal of mechanisms for related electrolyte aging reactions outside and inside the cell [1-3]. Furthermore, reducing the flammability and reactivity of the organic solvents, improving overcharge protection and developing more protective electrode/electrolytes interfaces plays a key role for the intrinsic (= passive) safety of the battery [4]. New electrolyte additives were investigated in terms of their flame retardant abilities and their influence on electrochemical performance. The electrolyte was analyzed as a whole system, as well as in view of its single constituting components. Novel safety/abuse tests and analytical methods were developed to better understand the effect of individual electrolyte components [5]. In this presentation, we will discuss the role of liquid organic solvent based electrolytes for safety and for cycle and calendar life of lithium ion batteries and how to conduct experiments elucidating this role. For instance, experiments to determine the self-extinguishing time of the electrolyte as well as nail penetration tests and heat-wait-search tests in an adiabatic reaction calorimeter (ARC-HWS) were carried out at different states of health to prove the functionality of specific electrolyte additives after long term cycling experiments.

Refs.:

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