Research and Implementation of Next Generation Batteries for Electrified Vehicles

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E-mobility is at a tipping point with increasingly optimistic forecasts for the future market-share of electrified vehicles. For such vehicles to achieve mass-market penetration, new powertrains must realize a reasonable balance between driving range, power, charge rate, safety and cost. Optimization of the high voltage battery pack down to the cell, electrode and material levels offers many performance improvements, yet each change necessitates significant re-tailoring of the system. Multivariable optimization of this sort requires high-throughput evaluation methods as well as a deep understanding of electrochemical, chemical and mechanical fundamentals. To apply demanding automotive requirements to new battery technologies, the BMW Group works with academic, national lab, and industry partners to understand the impacts of each design decision. Some innovations are challenging to discover but simple to implement via drop-in replacement (i.e. electrolyte and separator materials), while others require significant R&D inputs to scale (i.e. solid state batteries). This presentation will outline the opportunities and limitations of various cell and material concepts from a vehicle manufacturer's point of view.

Dr. Gittleson received his Ph.D. in chemical engineering from Yale University, where he developed functional nanomaterials for lithium batteries and composite multilayer thin films while studying mechanisms related to device failure. Starting in 2015, he served as a postdoctoral researcher at Sandia National Laboratories in California where he led projects on Li-air and solid state Li-ion battery development. He joined the BMW Group Technology Office USA in 2017 and currently manages BMW's R&D collaborations on battery and electrified powertrain technologies in the North America region.