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MODELING OF LITHIUM-ION BATTERY HEATING

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ABSTRACT

The vehicle electrification market is projected to [illegible] of vehicle electrification is replacing the power[illegible]ve systems and components by electric motors, mi[illegible]nd of vehicle electrification is as a result of the fluctuating cost of conventional fuels and growing environmental concerns. Although lead-acid batteries have long been used in many applications, they are found to be less suitable for electric vehicles when compared to nickel-metal hydride and lithium-ion batteries. As a matter of fact, the energy density for lithium-ion batteries is at least four times higher than that of a lead-acid battery, ensuring longer travel distance per charge, sufficient acceleration and greater longevity. Although NiMH batteries are currently the best choice for hybrid electric vehicle battery, their energy density is merely half of the lithium-ion battery. Aside from the thermal safety issue associated to the lithium-ion batteries, they are evidently more compact, lighter in weight, and relatively easier for packaging. This paper will present the feasibility of replacing the use of lead-acid batteries in electric car by lithium-ion batteries through an extensive comparison among the common battery types available in the market. Furthermore, this work has also numerically examined the feasibility of simplifying the heating mechanism of a lithium-ion battery module using the lumped-system approach. The mathematical model is capable of predicting average battery temperature. By assigning good estimation for heat generation rate, it is absolutely possible for the lumped system model to produce similar temperature fields and heat fluxes without introducing too much discrepancy. This approach will surely simplify and speed up the simulation process.

Version 2:
Figures and References are **excluded** in this version of extended abstract.

Keywords: Electric Cars, Li-Ion Battery, Temperature, Discharge Current, Simulation

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