Session – C

MODELING OF LITHIUM-ION BATTERY HEATING

J.C. Leon[1], D.D. Duncan[2]

[1]Dept. of Engineering Science, National Pingtung University of Science and Technology, No. 1, Shuefu Road, Neipu, Pingtung, 91201, Taiwan, ROC
[2]Nanoscience Centre, University of Cambridge, 32. J J Thomson Ave, Cambridge, CB3 0FF, UK
[1]jcleon@mail.npust.edu.tw, [2]

Version 1:
Figures and References are **included** in this version of extended abstract.

ABSTRACT

Although lead-acid batteries have long been used in many applications, they are found to be less suitable for electric vehicles (Fig. 1) 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 [1]. 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 [2]. This paper aims to numerically examine 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 (Fig. 2). 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 (Fig. 3).

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

Fig. 1. The pure electric car developed in NPUST

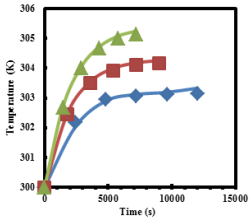

Fig. 2. Average temperature for different discharge currents

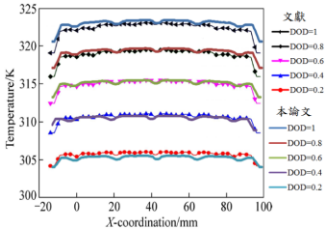

Fig. 3. Temperature profiles at different DOD's

References

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