

## **TITLE: PASSIVE BATTERY THERMAL MANAGEMENT IN ELECTRIC VEHICLES USING FIN EMBEDDED COMPOSITE PHASECHANGE MATERIALS**

Abstract: The efficiency and safety of battery packs installed in electric vehicles (EVs) are greatly influenced by their operating temperature. With demands for fast charging increasing, it is paramount that an effective battery thermal management system be incorporated. While there are numerous battery thermal management systems on the current market such as air, liquid, and refrigerant cooling; they require additional energy inputs consuming power from it's own battery pack. A novel solution to this predicament is through passive thermal management systems using phase change materials (PCMs) as a cooling medium. PCMs can absorb large quantities of heat passively and are able to regenerate itself as it cools. The PhD project aims at designing a passive thermal management system for the purpose of optimizing battery pack efficiency and to permit hastening of the uptake of electric vehicles in society.

The projects final prototype design will be a passive PCM thermal management system that is able to house standard lithium ion batteries, conduct heat away from the battery to the enclosed PCM material, enhance the thermal conductivity of the PCM whilst remaining structurally strong and conforming to a honeycomb structure to minimize space wastage. A PCM type that has a melting point close to the optimal temperature of the battery will be also identified as the latent heat energy at that temperature regulates the batteries temperature to such. Upon conceptualizing the ideal design that fits such requirements, optimization through computational fluid dynamics (CFD) based on the heat generated by the battery at varying charging rates will be performed. The structure will be parametrized with the idea of reducing its overall volume and weight while reducing the batteries maximum temperature as it goes through varying discharge rates. The final design will then be experimentally validated under varying ambient temperatures to determine its performance at varying climates.

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