

A review of Li-ion battery temperature control and a key future perspective on cutting-edge cooling methods for electrical vehicle applications

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Abstract

Covid-19 has given us a new way to look at our globe with regards to minimize air and noise pollution and thereby upgrading global environmental conditions. This positive pandemic outcome indicates that green energy is the future of energy, and one new origin of green energy is lithium-ion batteries (LIBs). Electric vehicles are constructed with LIBs, but they have a number of disadvantages, including poor thermal performance, thermal runaway, fire dangers, and a higher discharge rate in low- and high-temperature conditions. The underlying fault of LIBs is their temperature reactivity. Extreme temperatures and challenging working circumstances can cause lithium-ion cells to malfunction and cause the battery pack to overheat. For optimal performance in vehicles and long-term lithium-ion battery durability, LIBs must be thermally managed within their operating temperature span. This paper presents an overview of several cooling strategies used to maintain the internal battery pack temperature. This paper discusses cooling techniques using air, liquid, and Phase Change Material (PCM), Heat pipe(HP). Additionally, various battery pack configurations and heat generation techniques are explored. This research also discusses the usage of nanomaterials to address the battery pack's heat-related problems. This study emphasises the use of nanomaterial to boost the heat conductivity of coolant in order to raise the batteries temperature into their ideal working range (PCM as well as LC). This article also provides some of the research gaps that have been found and the crucial areas on which attention should be directed in order to build the best lithium-ion BTMS technology.

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