

## عنوان مقاله:

Nanostructured materials for optimized lithium-ion batteries: recent advancements and progress potentials

## محل انتشار:

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## نویسندگان:

E Poorshakoor - School of Metallurgy and Materials Engineering, Iran University of Science and Technology,  
Naarmak, Tehran, I.R. Iran

M DARAB - School of Metallurgy and Materials Engineering, Iran University of Science and Technology, Naarmak,  
Tehran, I.R. Iran

## خلاصه مقاله:

Being commercialized by Sony Corp., Japan in ۹۰s, lithium-ion batteries have now become an extremely attractive choice for energy storage in various applications including mobile electronics and electric vehicles. The key for their attractiveness is the remarkably high performance in energy storage when compared with other ambient-conditions operating batteries. While the energy density of the first-generation Li-ion was already high, the energy figures of today's units have been almost tripled. In addition to improved mechanical design and hardware engineering, the extraordinary development is due to optimized materials in electrodes, separators, and current collectors. Here the nanostructured materials play an important role being superior to conventional materials for different components of the Li-ion batteries. In terms of charge storage, nanoscale materials beat micron-sized due to extra available storage sites for lithium especially at the grain boundaries that leads to higher energy density products. Carbon nanotubes and nanofibers composite are examples for increasing storage capacity and improving the cycle life of the lithium-ion batteries that are being commercialized. Nanoparticles filled with lithium have also shown the potential to shorten the charge and discharge cycles, making fast-charge devices attainable. This is to address one of the most serious shortcomings of the Li-ion batteries-equipped electric cars. Nanoscale materials also helped boosting the adherence of electrodes and current collectors via activating larger fractions of surface sites for small scale attractions. The batteries with such technology typically ended up having higher degrees of integrity and more reliable cycle life. The abovementioned optimizations offered by nanoscience and technology for the advancement of the Li-ion batteries are reviewed in this paper. The promises of nanomaterials for the improvement of operation, durability and safety of LIBs are articulated for anode, cathode, electrolyte, and separators. The offers by the nanoparticles also extent to auxiliary systems for LIBs operation such as nanosized AgO for thermal management of LIBs.

## کلمات کلیدی:

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