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Li-ion battery research: Progress at C-MET and future plans

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Lithium batteries are characterized by high specific energy, high efficiency and long life. These unique properties have made lithium batteries the power sources of choice for the consumer electronics market with a production of the order of billions of units per year. These batteries are also expected to find a prominent role as ideal electrochemical storage systems in renewable energy plants, as well as power systems for sustainable vehicles, such as hybrid and electric vehicles. In order to develop the Li-ion battery technology Indigenously, C-MET has initiated and is actively working for the development of Active materials (cathode and anode) and has developed an entire battery fabrication and testing facility for button/coin type and pouch / rectangular cells under one roof. The development of materials for high energy batteries is a continuous process and C-MET is working for the development of novel materials for the high charge capacity and energy density. The facility has already been created for the large scale synthesis of active materials (500 gm batch level) using spraydryer (Fig.1 b). Lithium cobalt oxide ($LiCoO_2$) and Lithium iron Phosphate ($LiFePO_4$) has been synthesised and optimized via Sol-gel and hydrothermal synthesis method and used as a cathode materials. Lithium titanium oxide ($Li_4Ti_5O_{12}$) as an anode material has been synthesized via solid-solid combustion process. The nanostructured spherical hard carbon (anode material) has been synthesized using novel natural sources (potato, banana and sweet potatoes) and one Indian patent has been filed based on this invention. These developed cathode and anode materials were compared with the commercially available active materials (Aldrich and MTI, Corporation USA make) and fabricated prototype button/coin (2032type) cells (Fig.1 (c) and pouch/rectangular cells using the active materials developed by C-MET. The electrochemical performances of these cells are found to be similar to that of the commercially available active materials. We also have successfully developed thin, flexible & light weight batteries and also working for the development of polymer based electrolyte for Li-Polymer batteries. We have also initiated the activities for the development of Li-Air and Li-S batteries and Na-ion batteries for hybrid/electric vehicles for smart, green & clean transportation.

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