ARCI develops indigenous technology for synthesizing LTO Anode for fast charging Li-ion battery used in EVs

Lithium-Ion batteries are in high demand for portable electronic devices and electric vehicles. However, producing them involves a complicated process of synthesis of Lithium titanium oxide (LTO), the chemical needed for its anode, thus making the battery costly. Indian scientists have now found a simpler method to produce LTO which can make the battery less costly.

Researchers at the Centre for Nanomaterials, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) an autonomous institute under the Department of Science & Technology have developed a simple process for the synthesis of lithium titanium oxide (LTO), an anode material for high power Lithium-ion battery (LIB) application.

Lithium titanium oxide (LTO) has emerged as a promising anode material for high-power LIBs owing to its abundance, thermal stability, the excellent cycle life of 20000 cycles and safety. It undergoes negligible volume change during charging and discharging, which ensures an extremely long cycle life and can work under harsh ambient temperatures (-30 to +55°C), exhibiting recharge efficiency exceeding 98%, compared to other carbon-based anode materials. This makes it ideal for Indian climatic conditions.

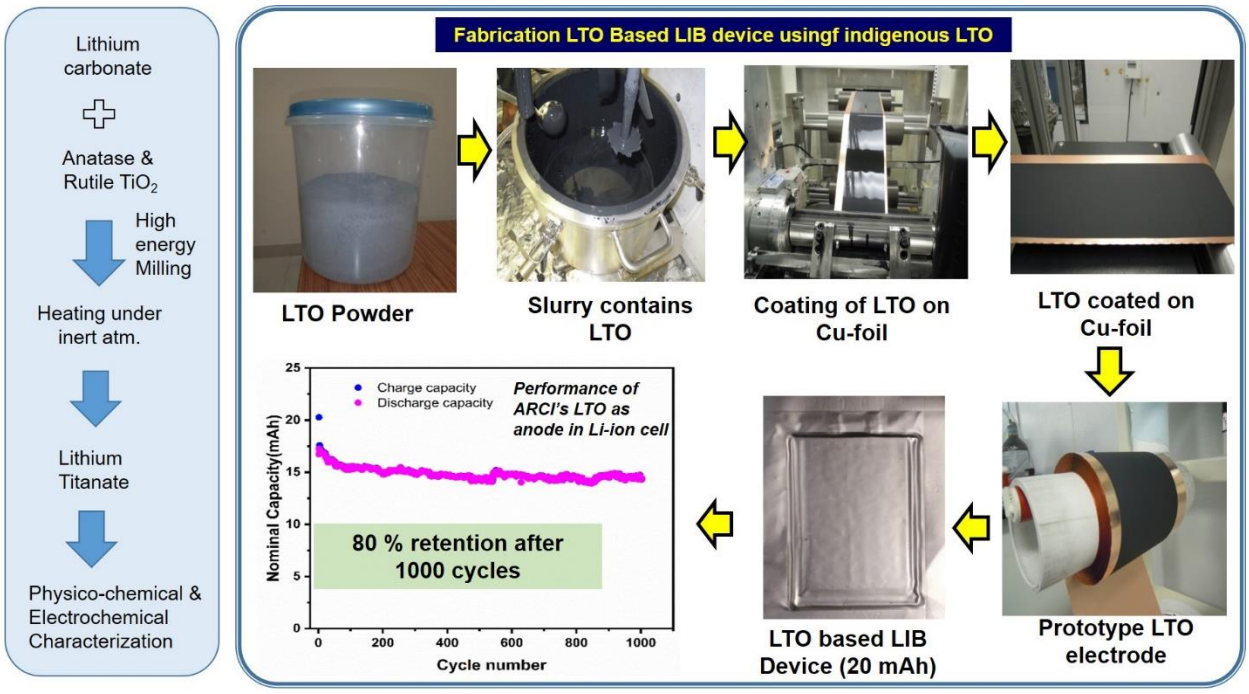
Though many techniques are available for the synthesis of LTO, they all involve highly complicated synthesis procedures, huge amount of solvents, toxic chemicals and expensive techniques. The measures followed to overcome the disadvantages of LTO like poor electronic and ionic conductivity require the addition of one more step to the synthesis process making it more complicated and unsuitable for commercial applications.

In order to address the above challenges, ARCI team focused on developing the simple, economical scalable and energy-efficient technique for production of LTO anode with improved electronic conductivity using TiO_2 and Li_2CO_3 as precursors. The advantages of high energy milling method are short processing time, low contamination, high relative velocity of balls and high energy input. Further, ARCI's technology has been tuned to be adaptable to any precursors.

ARCI's LTO has been validated in half cell and its performance was found to be very promising in terms of high specific capacity good rate capability and long cyclic stability which are better than the performance of commercial LTO obtained from Geylon, China. The production cost of ARCI's LTO is comparable with the cost of imported LTO by utilizing the pilot plant facility for the production of LTO at a level of 72kg/day. Patents for this process have been filed in India, USA, Japan, China, Germany and South Korea.

Efforts are underway for possible technology transfer to a private company, who is making LTO based LIB for Hybrid Vehicle application and have shown interest in ARCI's LTO technology.

For more details, contact Dr. S. Anandan (anandan@arci.res.in).



Process flow chart for the production of LTO, indigenously developed 2 Kg LTO powder and schematic representation for the fabrication of LTO based LIB device and the corresponding electrochemical performance