

## Low cost indigenous material for Li-ion batteries from ARCI can make electric vehicles affordable

Scientists 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 an innovative and low-cost process for the synthesis of in-situ carbon modified  $\text{LiFePO}_4$  (LFP), a cathode material for Lithium-ion batteries.

Li-ion batteries are the workhorses for electric vehicles which are being aggressively promoted because they are free of pollution. Currently, India imports 100% of these expensive batteries mostly from China and a large part of the cost comes from its cathode and the anode materials. This calls for indigenous electrode materials technology and associated components that are essential for the manufacturing of Li-ion batteries within the country.

$\text{LiFePO}_4$  (LFP) is a olivine (rock-forming mineral), discovered by John B Goodenough, who shared the 2019 Nobel prize in chemistry for the development of Li-ion batteries. It is an excellent cathode material by virtue of the intriguing features like the high maximum available capacity of 170 milliampere hours per gram (mAh/g), has a single voltage plateau of 3.45 V. Its characteristic features of non-toxicity (cobalt free) economic viability and long cycle life make it an ideal material for Lithium-ion batteries. The thermal stability of LFP is high and excellent with no exothermic reactions up to  $400^\circ\text{C}$  and hence ideal for Indian climatic conditions.

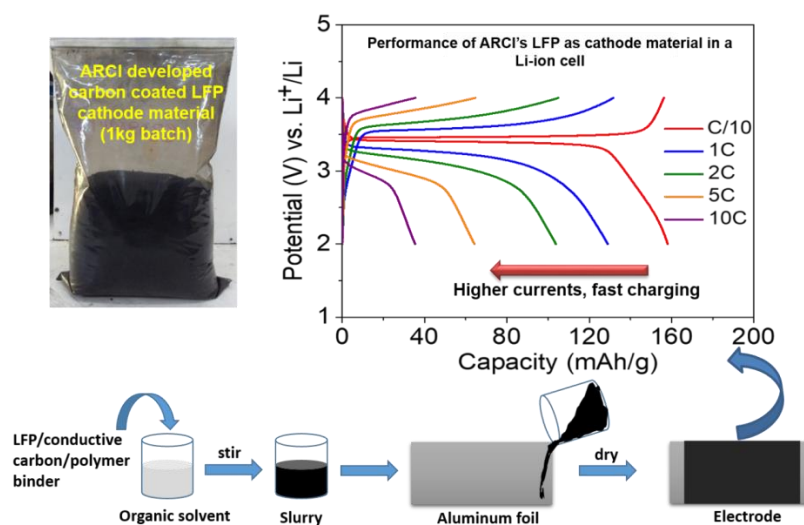


Figure: Indigenously developed 1kg batch LFP cathode material powder, schematic representation of electrode preparation, and the corresponding electrochemical performance.

The process developed by the ARCI team for synthesis of the cathode material is a scalable and a single step process for the synthesis of in-situ carbon modified  $\text{LiFePO}_4$ , which involves a modified solid-state method for the preparation of carbon-coated LFP with high rate performance. The ARCI' LFP outperformed the imported commercial grade LFP in terms of power capability. The indigenous methodology developed by ARCI to produce LFP will

significantly lower the battery cost per kilowatt-hour kWh, thereby making Li-ion batteries affordable.

This effort for the development of indigenous technology for manufacture of Li-ion in India initiated at ARCI will align with the National Mission to have the affordability of the EVs.

