International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

(An autonomous R&D Centre of Department of Science and Technology, Govt. of India)

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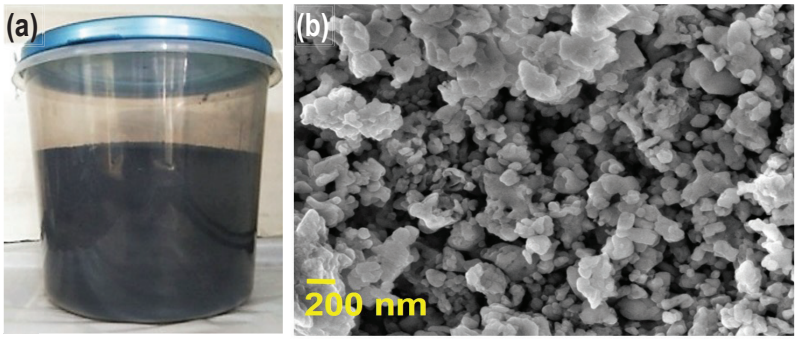
Technology for the production of LFP Cathode Material for Li-ion Batteries

Lithium-ion Battery (LIB) technology is fast emerging as the preferred energy storage alternative for both electric vehicles and stationary applications. The requirement of Li-ion batteries is increasing due to the target set by the Government of India that 30% of the vehicles produced in India should be electric vehicles by 2030. Presently, Li-ion cells as well as Li-ion battery packs are imported to meet the requirement in India. Hence, indigenizing the Li-ion battery technology is essential.

Li-ion Battery technology consists of many individual technologies such as electrode materials, current collectors, separator, electrolyte, etc. Material cost is ~ 60% of the cost of the Li-ion battery and the cathode material cost is ~ 32%. Thus, it is essential to develop an indigenous technology for the manufacture of electrode materials (cathode and anode) and support industrial organizations in LIB technology to make India self-reliant.

In line with the above requirement and the '**Atmanirbhar Bharat Abhiyan**' or '**Self-Reliant India Mission**', ARCI has developed **an indigenous technology for the production of battery grade Lithium Iron Phosphate (LFP) cathode material for Li-ion Batteries**. The unique know-how developed by ARCI involves solid state synthesis of carbon coated LFP in a single step. The established process gives crystalline LFP with sub-micron particle size. The physical properties of LFP developed at ARCI are given in Table 1. The electrochemical performance of ARCI developed LFP has been validated in coin cell and cylindrical cell configurations and it shows promising performance in terms of high discharge capacity and excellent rate capability on par with the performances of commercial LFP materials as shown in Figure c.

The technology is available for **transfer on non-exclusive basis**.



(c)

Material	Specific Discharge Capacity (mAh/g)*				
	C-Rate	C/10	1C	2C	5C
ARCI-LFP		≥ 155	≥ 139	≥ 130	≥ 110
Commercial LFP-1		≥ 152	≥ 130	≥ 115	≥ 76
Commercial LFP-2		≥ 154	≥ 140	≥ 131	≥ 97

* *Data analyzed for 10 measurements*

Figure: *(a) Photograph of ARCI's LFP Powder, (b) FE-SEM image and (c) Electrochemical performance of ARCI's LFP and Commercial LFP materials.*

Table 1: Physico-chemical properties of ARCI's LFP

Sl. No	Parameters	ARCI's LFP
1	Appearance	Black
2	Particle size (nm):	
	D_{10}	117
	D_{50}	175
	D_{90}	283
3	Carbon (wt. %) range	2.7 -5.5 ± 0.2
4	Surface Area (m^2/g)	28±2
5	Tap Density (g/ml)	0.7 ± 0.1
6	pH Value	8.3 ±0.5
7	Moisture	< 500 ppm
8	Sieve Residue	0 % ; 45 µm (450ASTM) mesh

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