

## Procurement Plan for 2023-24 and Beyond

Sl. No.	Equipment Details
1	Fully Automated Compression Testing Machine 1000kN / 3000kN
2	Rapid chloride ion penetration test (RCPT) apparatus
3	Universal testing machine (UTM)
4	Loading frame test setup with data logger, displacement transducer and supporting elements
5	Advanced Cyclic Corrosion Cabinet with the following options Controlled RH option Air Actuated Cover lifters for simulating ambient conditions. SO2 adder package Immersion capabilities Mechanical Cooling down to -20 deg C. High-Temperature operation up to 90 deg C
6	High-Capacity Universal Testing Systems for Tensile, Compression, and Flexure Testing with minimum capacity of 1000 kN (100 tonnes).
7	Climatic test chamber
8	PH/MV/TEMP/Conductivity Meter - Hand held and portable type
9	Earth / Ground tester
10	Small Punch Creep Testing System
11	Spot Welding Machine
12	DFT Gauge
13	Duplex Coating System Thickness Gauge
14	Pipeline Locator (Multi-purpose Precision Locator, Cable and Pipe Locator, Locate System Receiver, Multi-function Precision Locator)
15	Environmental Chamber (1000 Litres) covering temperature range from -20 to 100 °C
16	Long Tape Casting Coater 250 mm W x 800 mm L Vacuum Bed with 250 mm Adjustable Doctor Blade
17	Temperature Chamber with safety feature for LIB Testing
18	Battery short circuit test chamber
19	E-Rickshaw - 4
20	Vacuum oven with pump -250 lit 300 C
21	Vacuum oven with pump -250 lit 300 C
22	Jet pulveriser mill set- 2 Nos
23	Pouch sealing machine
24	Tubular Furnace
25	Precision Balance (0.00001 mg accuracy)
26	Electrode winding machine for 4680 cylindrical cell
27	Fume hood
28	ARC software update
29	Viscometer
30	Spot welding machine
31	IR measurement unit
32	GPU/CPU based Computing Cluster for ML based studies
33	Microwave Digester for ICP-OES
34	High Temperature Melting Furnace
35	RF Plasma Chemical Vapor Deposition System
36	15 kW hybrid nano sphero induction plasma system (Spheroidization unit for powders)
37	WD-XRF
38	Viscometer-Cone and plate model

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39	DC sputtering with 3 targets
40	Fully automated screen printer for preparing customizable electrode platforms.
41	Clean room facility
42	Bio-MEMS handling compartment / Unit
43	RT-PCR, Qubit 4 Fluorometer, E-Gel Imager
44	3D Ceramic Printer
45	High Capacity Electrolyser Testing Unit
46	Deionized water plant (500 L/day)
47	Gas controlled / vacuum high temperature furnace
48	Plasma Cleaner
49	3D Scanner
50	3D Polymer printer
51	Shell and Tube Heat Exchanger
52	Heat Transfer through Composite Walls-Power Supply
53	Emissivity Measurement Unit
54	Flow Transmitter / Meter
55	CSTR in Series Reactor
56	Packed Bed Reactor
57	Temperature Dependent Kinetics Set up
58	Batch Reactor
59	Peristaltic Pump
60	High pressure gas adsorption unit
61	High pressure Adsorption production capacity unit, setup Furnace, Mixing reactors, Tray hot dryer, vacuum dryer, Filtration unit, Extruder & Spheronizer, Installation and commissioning expenses, Packaging and storage, 2 year operating and maintenances of equipment's
62	CO2 adsorption analysis unit
63	BET analyser
64	Carbonation Chamber
65	Dry mix palletisation machine
66	IR Based CO2 analysers - 4nos.,
67	MFC - 3 nos
68	Compressor blowing pumps - 3nos
69	CO2 absorber
70	Settling tank line heater - 5nos
71	Gas liquid separator storage vessel - fresh solvent load cell CO2 product compressor Cylinders for CO2 storage 3 nos
72	simulation software Aspen plus
73	Volumetric gas separation unit
74	Thermal evaporation gold coating unit
75	Bench top spray pyrolysis unit
76	Spin coater with UV curing
77	Dedicated glove box for PSC fabrication
78	Power back-up UPS for the instruments
79	High temperature furnace and accessories
80	High current electrochemical workstation
81	Hot press with controlled pressure and temperature
82	High current electrochemical workstation
83	Minor equipments: Magnetic stirring plates, electric vacuum oven, probe sonicator and its accessories

Sl. No.	Equipment Details
84	Semi-automated hydrometallurgical set up for synthesis of the cathode materials
85	A dedicated BET surface area analyzer
86	High temperature furnace
87	Crystallizer
88	Recirculating water chiller
89	Redox auto-titrator
90	Micro hardness equipment
91	Furnace for post treatment process
92	Palletizing machine
93	Aggregate crushing value apparatus
94	Buoyancy Balance
95	Freezer
96	Centrifuge
97	Data Acquisition Unit with 60 channels, 300V, 100mA, 1MHz
98	High-end computer for simulations
99	Coating machine
100	SMPS 3U VBV 50V - 200A PSU
101	SMPS 3U VBV 30V - 500A PSU
102	Hydraulic press
103	3D design software
104	Micro gas chromatography
105	Electrochemical workstation,
106	H2 sensor
107	O2 sensor
108	H2 Flowmeter
109	O2 Flowmeter
110	Pressure transducer
111	Ansys fluent software (with computer)
112	Solid works software
113	3D-optical microscope
114	Solar panel (30 KW ) with battery back-up & AC DC converter
115	Contact angle measurement
116	Water purification unit
117	Nitrogen generator
118	Gas controlled HT Furnace
119	Sieve shaker
120	Conductivity analyser (Scribner),
121	Viscometer(Brookefield),
122	Hot air oven/Vacuum Pump
123	Balance (200 g),
124	Balance (10 kg)
125	Balance (100 kg).
126	SMPS (2 A),
127	SMPS (5 A)
128	SMPS (10 A)
129	Height adjustable stand for electrolyser
130	Auto torque machine
131	Mini grinding wheel
132	Electrospinning unit
133	Metal cutting machine
134	Pellet making machine

<b>Sl. No.</b>	<b>Equipment Details</b>
135	Potentiostat
136	UTM, Doctor Blade
137	Regulators and Hydrogen safety sensors
138	Vacuum oven
139	Fuel cell fixture and components
140	Autoclave
141	Reactors for the Scale-up activity
142	Rotating electrode rotator set-up
143	Doctoral blade setup for fabrication of membranes
144	Bench top UTM to measure the tensile properties of membranes
145	Potentiostat for membrane resistance
146	Fuel Cell Test Station
147	Humidity Chamber interfaced with Potentiostat
148	Gas Chromatography
149	Millipore water system
150	Decal coat system
151	Hot press (1 ton)
152	Thermo gravimetric analysis (TGA),
153	Current source/nano-voltmeter
154	FE-SEM instrument
155	XRD
156	BET Surface area
157	HR TEM
158	Jet Impingement Rig
159	Pumps
160	Flow meter
161	Pressure gauge
162	AI Workstation
163	Special probe designed and in-built in the instrument
164	Electrochemical device to control voltage and measuring current
165	3D polymer printer
166	Pre-processing, Post processing and characterization equipments
167	Environmental chamber
168	Extruder
169	High pressure pumps and other accessories
170	Audio - Video recording equipment
171	Software for creating virtual lab
172	Specially designed redox flow battery tester which includes impedance analysis, state of charge (SOC), RDE / RRDE.
173	Environmental chambers
174	Pumps for electrolyte circulation
175	Solar panels for charging the stack.
176	Hot press cell assembly
177	Fast scan multimode optical-diode array spectrophotometer
178	Ultra-Low Refrigerated circulators with heating/cooling coils
179	Ultra high vacuum chamber for the purification of polymeric materials
180	Desktop Computers and Servers
181	Laser Printers
182	Core Switch and Edge Switches
183	System Software and Packages (Windows OS, MS-Office, Visual Studio, SQL Server, etc.,)
184	Electrochemical Analyzer (Potentiostat / Galvanostat Unit)
185	Advanced Energy Test system for DC & EIS
186	Multichannel Electrochemical Workstation

<b>Sl. No.</b>	<b>Equipment Details</b>
187	Energy Dispersive X-Ray Fluorescence Spectrometer (ED-XRF)
188	Gas Permeability Analyzer
189	High End Computer Workstation
190	Electrochemical Workstation with Electrochemical Impedance Analyzer
191	Electrochemical Workstation for Liquid-Liquid Interface Analysis
192	Electrochemical workstation for Voltammetry, Potentiostatic and Galvanostatic experiments
193	Planetary Centrifugal Mixer
194	Inductive Coupled Plasma Mass Spectrometer(ICP-MS) with Accessories
195	Battery Cell Simulator

### Consumables

<b>Sl. No.</b>	<b>Description</b>
1	Liquid Helium
2	KrF gas cylinder
3	Tanaka Platinum catalysts / Platinum on carbon black.
4	Software ICDD XRD Database
5	Zirfon Membrane
6	GORE select membrane roll
7	Battery consumables for LI-ION battery
8	EOS METAL POWDER INCONEL 718, AISi10Mg, STAINLESS STEEL 316L, Ti-6Al-4V

**Procurement Plan for 2024-25**

**a) List of the Equipment for CSIR Projects**

<b>Sl. No.</b>	<b>Equipment Details</b>
1	Water bath shaker
2	3D design software.
3	Vacuum coating unit
4	Material testing unit (UTM)
5	Probe sonicated facility (high frequency)
6	Homogenizer unit
7	High Pressure and Temperature Flow Reactor
8	Contact angle measurement unit
9	Bench top melt extrusion with hot pressing facility
10	Magnetic stirrer
11	Bath sonicator
12	Desktop Computers
13	Hydrogen Recirculation Pump
14	Freeze dryer
15	Pulverizer
16	Homogenizer
17	High temperature Melting Furnace
18	Hot Rolling Machine
19	Micro UTM
20	Powder Mixer
21	Programmable Dip-coating instrument
22	Programmable high-temperature vacuum furnace with movable zone
23	Micro hardness tester
24	High temperature pyrolysis furnace (2000 °C) with inert gas facility
25	Duplex coating thickness gauge
26	Custom designed Rare Earth Molten Salt Electrowinning set-up including Furnace, DC rectifiers, Inert atmosphere retorts, salt feeding and metal tapping systems, scrubbers, gas manifolds, simulators, chillers with necessary accessories and safety systems
27	Custom designed inert atmosphere glove-box integrated with furnace for handling, storage and processing of air-sensitive products
28	Material characterization and elemental analyser → EDXRF
29	Sample preparation platform for advanced microscopy of metallurgical samples
30	Suitable box, tubular and portable Induction Furnaces for Melting of powder products
31	Pre-treatment and post-separation, purification and isolation of metal products. Vacuum distillation set-up, vacuum tray dryers, ball mill, Vibrator Sieve, Flotation Machine, Pressure Filter Press, Solvent Removal Systems, Crystalliser, Vacuum evaporator, size-reducer, Centrifuge, Pressurized / GL leaching tank, batch and continuous flow reactors. Any other custom designed or fabricated item related to the RE alloys
32	Molten Salt Electrolysers
33	Inductively Coupled Plasma Mass Spectrometry
34	Wavelength Dispersive X-ray Fluorescence Spectrophotometer
35	Vacuum Distillation unit for Magnesium

Sl. No.	Equipment Details
36	Hydrogen Furnace
37	High Power Source Meter (Variable resistance, current & voltage)
38	Minor equipment (Stirrers, Multimeters, pH meter)
39	Electronic circuit boards for integration of EBCs
40	Prototype cell fabrication and assembly of EBCs components along with signal conditioning and processing units
38	Automated Hydrometallurgical Facility with leaching, precipitation reactors, and SX facility (capacity; to process 25 kg of the feed material). Spray Tray Dryers and Cyclone-Electrowinning Set up.
39	A 25 Kg/ Batch NMC cathode active material (CAM) production facility by flame assisted spray pyrolysis combined with continuous stirring tank reactor (CSTR) having solution recycle unit ( mixer, filtration unit dryer, Sintering Kiln, high temp furnace, size classifier and deagglomerator), high temperature furnace.
40	50 Channel formation cycler ( 5V/6A)
41	Bench top In-situ spray pyrolysis unit
42	Four magnetic stirrer with heating mantles, a DC source for reference electrode preparation, a mass flow controller for reactant gas, a single-cell device with an area of 4 and 25 cm <sup>2</sup> with heating facilities.
43	Environmental chamber
44	High Performance computer For carrying out battery modeling. High performance workstation is required for modelling, efficient simulation and optimization
45	Matlab software license. For carrying out simulations and for data pre-processing the software package is needed
46	WD-XRF
47	Inductively Coupled Plasma Mass Spectrometry (ICPMS)
48	Energy Dispersive X-Ray Fluorescence Spectrometer
49	Chassis Based Layer 3 Core Switch
50	Lithium-ion battery fabrication plant in Chennai Unit
51	RRDE System with WV10 Electrode Rotator and Accessories
52	Thermal Conductivity Meter
53	Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) Equipment
54	Particle size Analyzer with ZETA potential measurement
55	X-Ray Fluorescence(XRF) Analyzer
56	Upgradation of Scanning Probe Microscope

**b) List of the Equipment for ECF Projects**

Sl. No.	Equipment Details
1	Moving zone tubular furnace
2	Dip coating unit
3	Battery Cell Simulator
4	Ansys Fluent Software with Workstation
5	Hardware server and software with workstation
6	Atomic Emission Spectrometer.
7	Battery Cell Simulator
8	Ansys Fluent Software with Workstation
9	Hardware server and software with workstation

<b>Sl. No.</b>	<b>Equipment Details</b>
10	Flow battery testing unit for analysing the stack performance of Redox flow batteries.
11	Flow battery testing unit for analysing the stack performance of Redox flow batteries
12	Pumps at various capacities with digital controller
13	VASP Software

**Procurement Plan Up to 2025-2029**

<b>Sl. No.</b>	<b>Equipment Details</b>
1	TABLETOP MASKLESS ALIGNER
2	High vacuum probe station
3	Wafer dicing equipment
4	Wire bonder
5	Raman spectrometer
6	Ion chromatography
7	Electrolyser test station of capacity 300 W
8	Gas Chromatography
9	Liquid Droplets Erosion Rig
10	Air-Sand Erosion Test Rig
11	Circular Dichroism (CD) Spectrometer
12	Dual channel electrochemical workstation
13	Custom made glove box
14	Ultrasonic spray pyrolysis
15	Class AAA Solar Simulator
16	BET surface area analyzer
17	Pulverizer
18	Homogenizer
19	Lyophilizer
20	Freeze Dryer
21	Young's modulus apparatus
22	Field deployable electrochemical workstation with wireless communication
23	Flexographic printers
24	Multiplexed electrochemical workstation
25	Electrochemical surface plasmon resonance spectroscopy
26	Materials printer for sensor