GFCL EV Products Limited

GFCL EV INTRODUCTION

An INOXGFL Group Company

INOX GFL GROUP

- INOXGFL is one of the largest business groups in India with a legacy spanning over 90 years.
- The Group has diversified business segments: specialty chemicals, fluoropolymers, gases, wind turbines and renewables.
- The Group currently with 4 listed entities has a market capitalization of 5 Bn USD.

INOXGFL GROUP
BEYOND INFINITY

Chemical Business

- Gujarat Fluorochemicals Ltd, a leading Indian Chemicals Company
- Business verticals: Fluoropolymers, Fluorospecialities & Chemicals.
- The only PTFE / fluoropolymer manufacturer in India.

- GFCL EV is a 100% subsidiary of GFL, manufacturing intermediate materials for Lithium-ion Battery

- GFCL Solar & Green Hydrogen is a 100% subsidiary of GFL, developing products like membranes with applications in green hydrogen

Renewable Energy Business

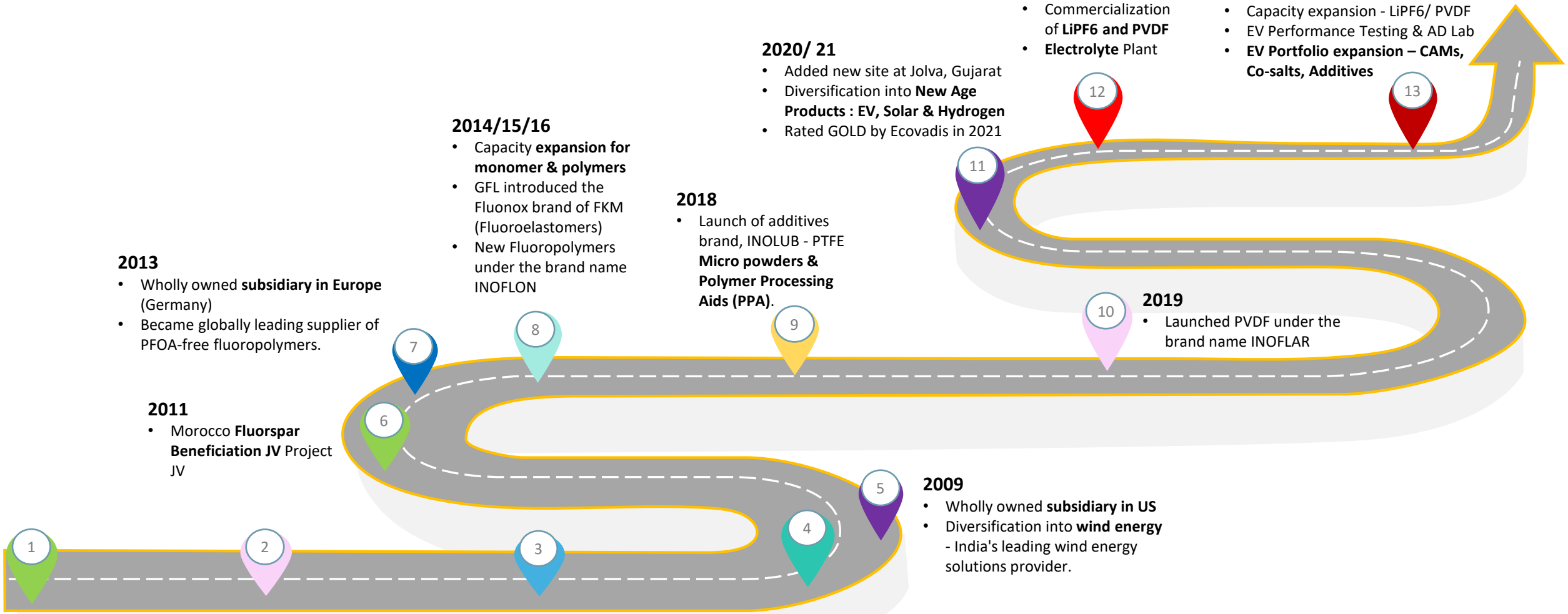
- Inox Wind Ltd is a fully integrated player in the wind energy market and provides end-to-end turnkey solutions.

INOX Green Energy Services Limited is India's leading wind O&M services player with more than 10 years of operating history.

Inox Wind Energy Ltd is the holding company of the wind business.

GROUP JOURNEY…..

GFCL EV Products Limited



1987
- GFL incorporated as a **Refrigerant** manufacturer in India

1988
- Launch of a **public issue**.
- Established CFC Refrigerant gas, Hydrofluoric Acid units in Panchmahal Gujarat.

2006
- Implementation of Clean Development Mechanism Project at Ranjitnagar, Gujarat.
- **Carbon Credits** issued by the UNFCCC

2007
- **Chemical complex at Dahej**, Gujarat – with caustic soda & chlorine, a chloro-methane & PTFE units and CPP

2009
- Wholly owned **subsidiary in US**
- Diversification into **wind energy** - India's leading wind energy solutions provider.

2011
- Morocco **Fluorspar Beneficiation JV** Project JV

2013
- Wholly owned **subsidiary in Europe** (Germany)
- Became globally leading supplier of PFOA-free fluoropolymers.

2014/15/16
- Capacity **expansion for monomer & polymers**
- GFL introduced the Fluonox brand of FKM (Fluoroelastomers)
- New Fluoropolymers under the brand name INOFLON

2018
- Launch of additives brand, INOLUB - PTFE **Micro powders & Polymer Processing Aids (PPA)**.

2019
- Launched PVDF under the brand name INOFLAR

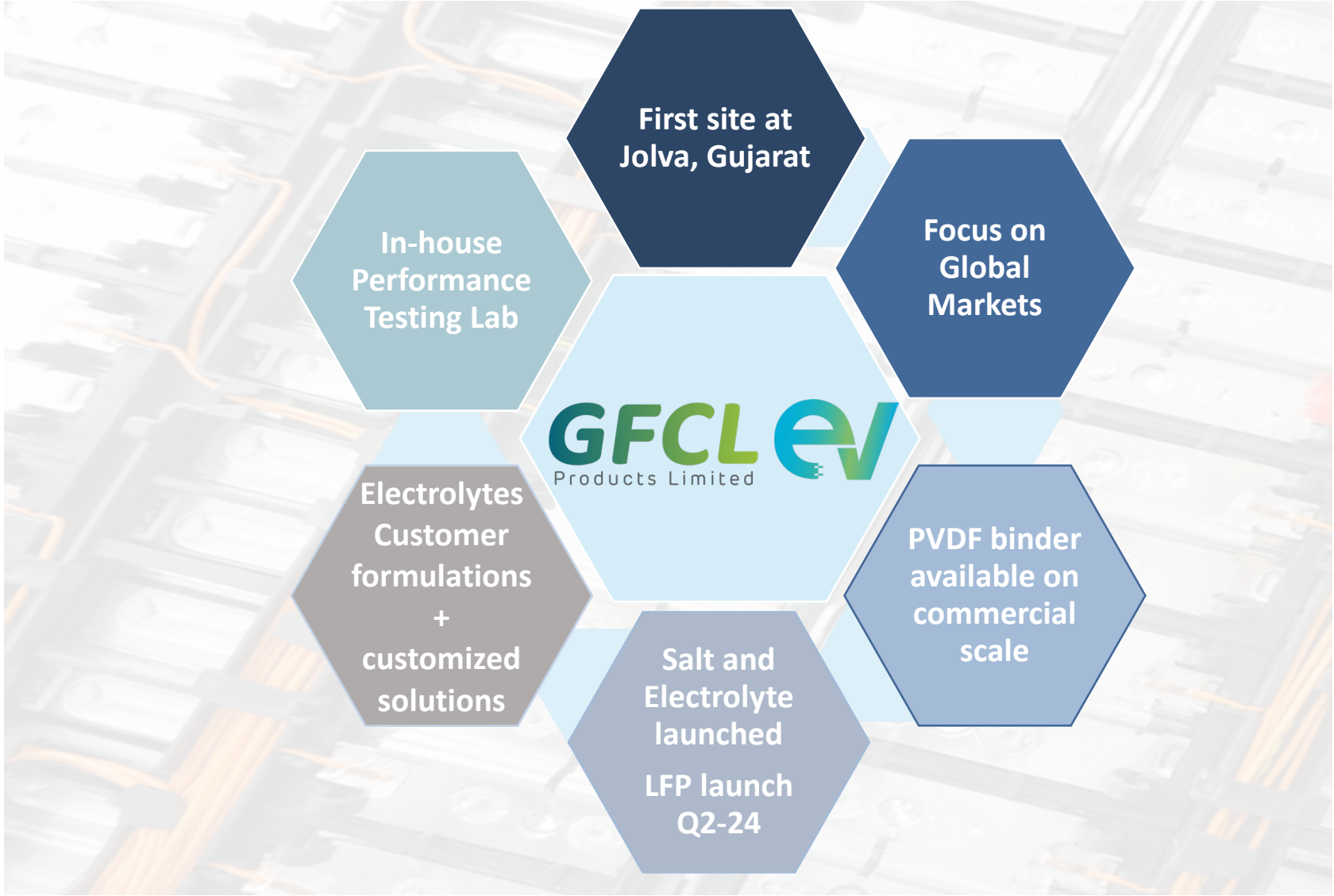
2020/ 21
- Added new site at Jolva, Gujarat
- Diversification into **New Age Products : EV, Solar & Hydrogen**
- Rated GOLD by Ecovadis in 2021

2023
- Commercialization of **LiPF6 and PVDF**
- **Electrolyte** Plant

2024 onwards
- Capacity expansion - LiPF6/ PVDF
- EV Performance Testing & AD Lab
- **EV Portfolio expansion – CAMs, Co-salts, Additives**

GFCL EV INTRODUCTION

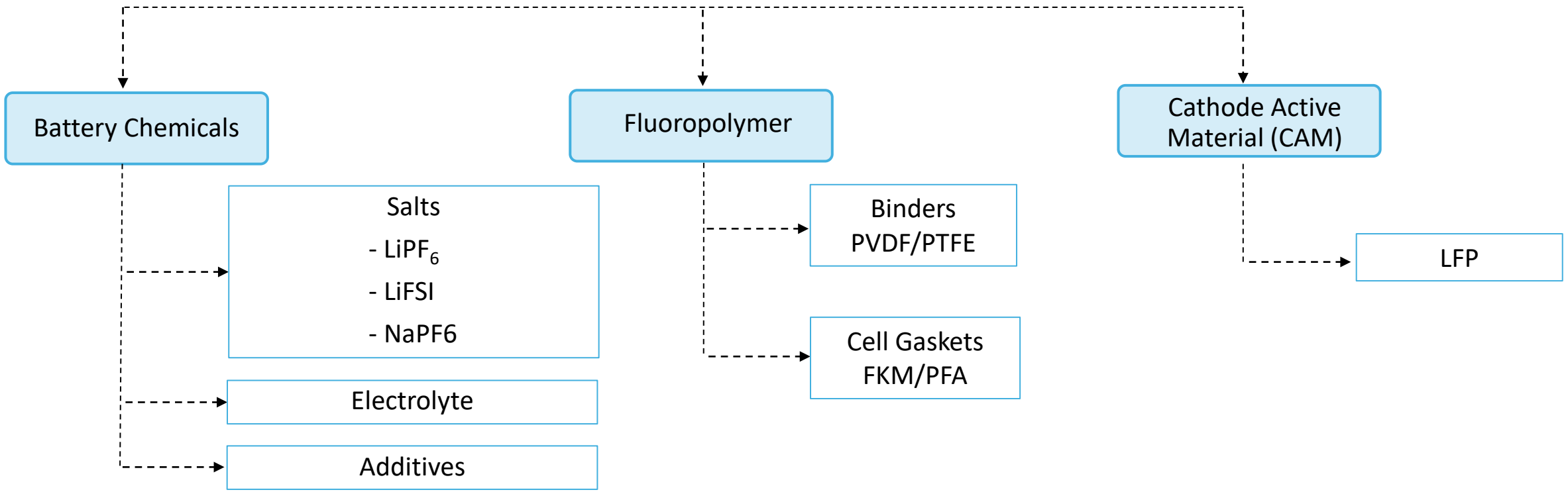
GFCL EV CREATED TO BRING CRITICAL BATTERY MATERIALS TO THE US AND GLOBAL MARKETS



OUR OBJECTIVES

- Focus on driving global EV adoption to support sustainable development
- Evolve into EV and Energy Storage components partner
- Achieve preferred supplier status with our customers
- Minimize carbon footprint while promoting strong safety culture
- Supply chain security through vertical integration
- Relentless focus on quality and on time delivery

GFCL EV – PRODUCT PORTFOLIO



- **Portfolio consists of ~> 35% value of EV Batteries and ~> 15% value of Electric Vehicles**
- **Mines to end-product integration of IRA-compliant critical minerals (Lithium & Flourspar)**
- **Electrolyte formulations: Customer formulations + customized solutions**
- **Inhouse performance testing lab**

Salts

GFCL ev Products Limited

Products and Commercial Status

- High purity salts for LiB and Na ion battery electrolyte
- Suited for all chemistries
- Fully scaled up LiPF6
- R&D focus on LiFSI and NaPF6
  - Goal to commercialize in 2H'24

Why GFCLEV?

- Full vertically integrated - Fluorine mines
- > 35 years experience in manufacturing AHF, which is the building block for all fluorochemicals
- Best-in-class performance – solubility, purity, ionic conductivity
- Strong history of production, sales and support of fluoropolymers globally
- Compliant with IRA across the entire supply chain – allows for strong SC security

Summary of product information	
Chemical Name	Lithium Hexafluorophosphate
CAS number	21324-40-3
Chemical Formula	$LiPF_6$
Structural Formula	
Molecular Weight	151.9
Appearance	Powder
Color	White
Physical and Chemical Properties	
Density (g/cm3)	1.5
Solubility	Soluble
Flash Point (°C)	25
Melting Point (°C)	200
Packaging specifications	
Stainless steel drum	120 Kg

Additives

Products and Commercial Status

- High purity additives for electrolytes of all chemistries
- Key products – VC, FEC
- Currently scaling up for large volume production

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Summary of product information	
Chemical Name	Vinylene Carbonate
Other Name	1,3-dioxol-2-one
CAS number	872-36-6
Chemical Formula	$C_3H_2O_3$
Structural Formula	
Molecular Weight	86.05
Appearance	Liquid
Color	Colorless or light yellow
Physical and Chemical Properties	
Density (g/cm3)	1.355
Boiling Point (°C)	178
Flash Point (°C)	73
Melting Point (°C)	22
Packaging specifications	
Stainless steel drum	200 Kg

Summary of product information	
Chemical Name	Fluoroethylene Carbonate
Other Name	4-Fluoro-1,3-dioxolan-2-one
CAS number	114435-02-8
Chemical Formula	$C_3H_3FO_3$
Structural Formula	
Molecular Weight	106.05
Appearance	Liquid
Color	Colorless
Physical and Chemical Properties	
Density (g/cm3)	1.45
Boiling Point (°C)	212
Flash Point (°C)	102
Melting Point (°C)	18-23
Packaging specifications	
Stainless steel drum	200 Kg

Electrolyte Formulation

Products and Commercial Status

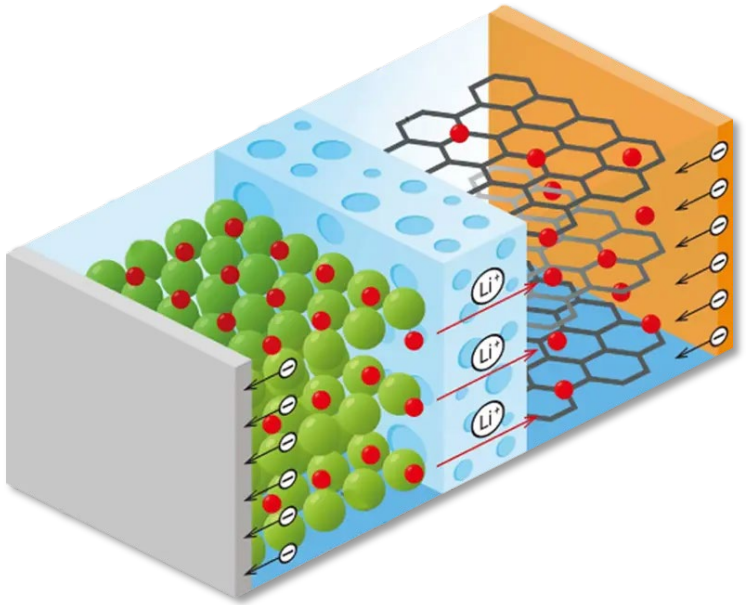
- Customized electrolyte formulation for LiB, Na ion and SSB
- Variety of blends based on customer needs and requirements
- Currently in the process of commercializing multiple formulations

Why GFCLEV?

- Strong vertical integration
- Experience manufacturing critical building blocks – salt, additives
- Long term experience in blending formulations
- Strong electrochemical and process experience
- Compliant with IRA across the entire supply chain – allows for strong SC security

Typical Electrolyte Properties

Parameter	Values
Moisture (ppm)	< 25
Free acid as HF (ppm)	< 50
Viscosity (mPa.s)	< 5
Conductivity (mS/cm)	> 10



Cathode Active Material

GFCL EV Products Limited

Products and Commercial Status

- Cathode Active Material and precursors for high performance LiB
- LFP CAM for safer, lower cost cells
- Target commercialization date in 2H'24

Why GFCLEV?

- Broad portfolio of solutions in the LiB and energy storage space
- Experience in manufacturing high purity materials in commercial scale
- Competitive cost structure
- Pathway to vertically integrate for LFP CAM
- Compliant with IRA across the entire supply chain – allows for strong SC security

Properties	Reference	UOM	GFCL EV process capability	Sample currently available
Appearance	Physical appearance of output material		Black powder	Black Powder
Specific Area	Specific Surface area SSA	m^2/gm	11.9 to 14.6	12.09
Particle Size	Particle size D10	µm	0.41 to 0.6	0.41
	Particle size D50	µm	1.1 to 2.1	1.31
	Particle size D100	µm	≤ 35	15.228
Density	Density - Tap	g/cm^3	≥ 0.7	1
	Density- Compact	g/cm^3	2.3 to 2.5	2.421
Elemental Composition	Carbon(C)	%	1.2 - 1.5	1.34
	Iron (Fe)	%	33.6 - 35.6	34.3
	Phosphorous (P)	%	18.5 - 20.5	19.54
	Lithium (Li)	%	4.25 - 4.55	4.41
Others	pH of 5% Dispersion in water		8 to 10	9.19
	Sodium (Na) + Potassium (K)	ppm	150	121
	Copper (Cu)	ppm	≤ 50	Cr+Ni+Cu+Zn<= 25
	Moisture	ppm	< 600	557
	Magnetic material	ppm	< 1	0.038
Performance Characteristics @ 25° C*				
Charge Discharge Characteristics	Initial specific discharge capacity @ 0.1C	mAh/g	≥155	160.95
	Initial Coulombic efficiency	%	≥ 95	98.05

*** Cell type: 2430 |Anode: Litium Metal | ELelectrolyte: LiPF6 1.0 M, EC:EMC:DMC**

INOFLAR™ PVDF binders

Higher Molecular weight/Functionalization = **Higher Adhesion** = **Higher Energy Density and Lower Binder demand**

1st Generation

Medium molecular weight PVDF Homopolymers

(< 300K Da)

2nd Generation

High molecular weight PVDF Homopolymers

(< 600K Da)

3rd Generation

Very High molecular weight PVDF Homopolymers

Inoflar™ 1150 (700K – 800K Da)*

Inoflar™ 1155 (> 800K Da)*

4th Generation

Very High molecular weight Functionalized PVDF

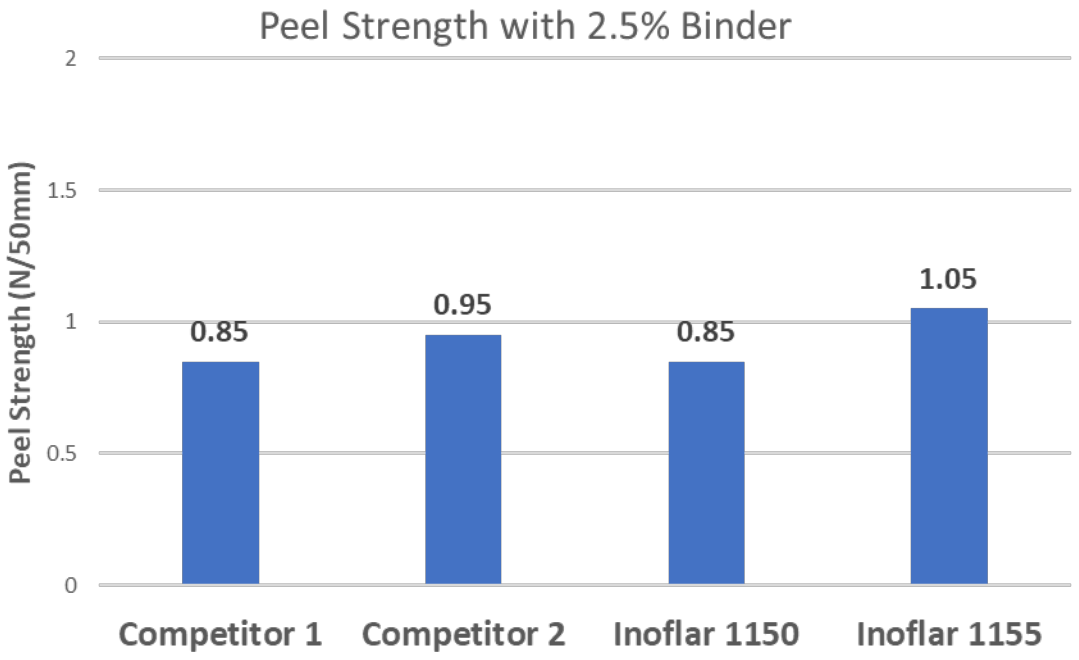
Inoflar™ 3160 (> 800K Da)*

Fluoro-Surfactant FREE

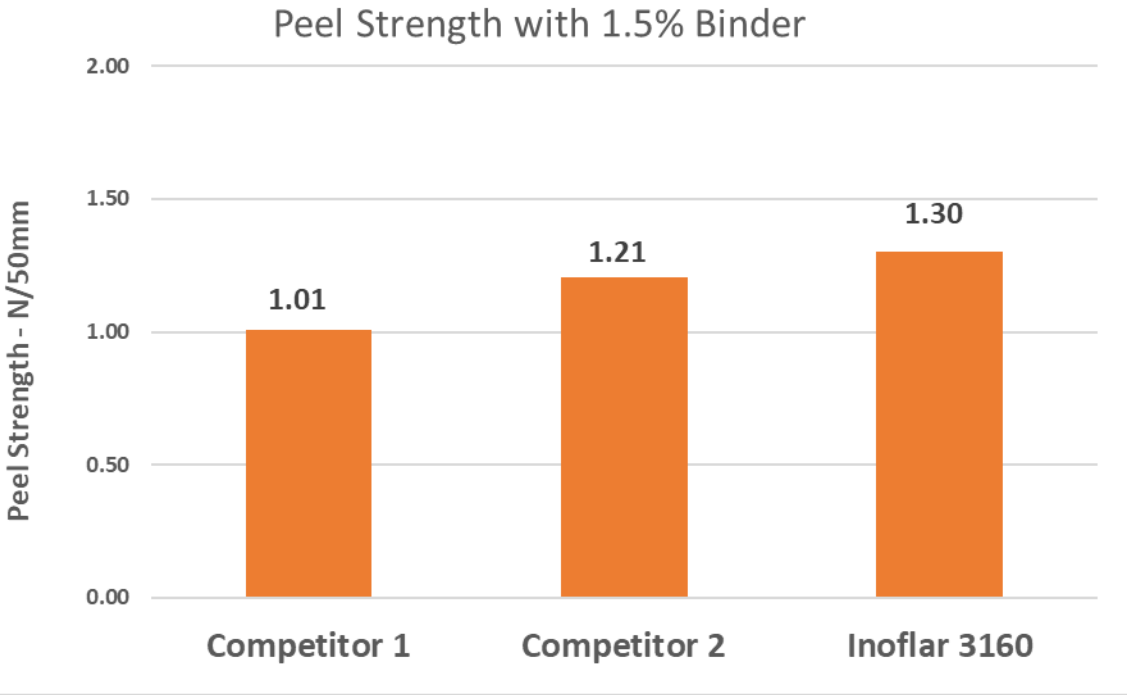
INOFLAR ™ PVDF resins are manufactured without the use of fluoro-surfactants

*Molecular weight data are obtained by gel permeation chromatography in dimethylacetamide (DMAC), calibrated using PMMA *standards useful for a relative comparison*

INOFLAR™ PVDF binders



Adhesion comparison of homopolymer PVDF binders with LFP



Adhesion comparison of functionalized PVDF binders with LFP

Thank You!

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