

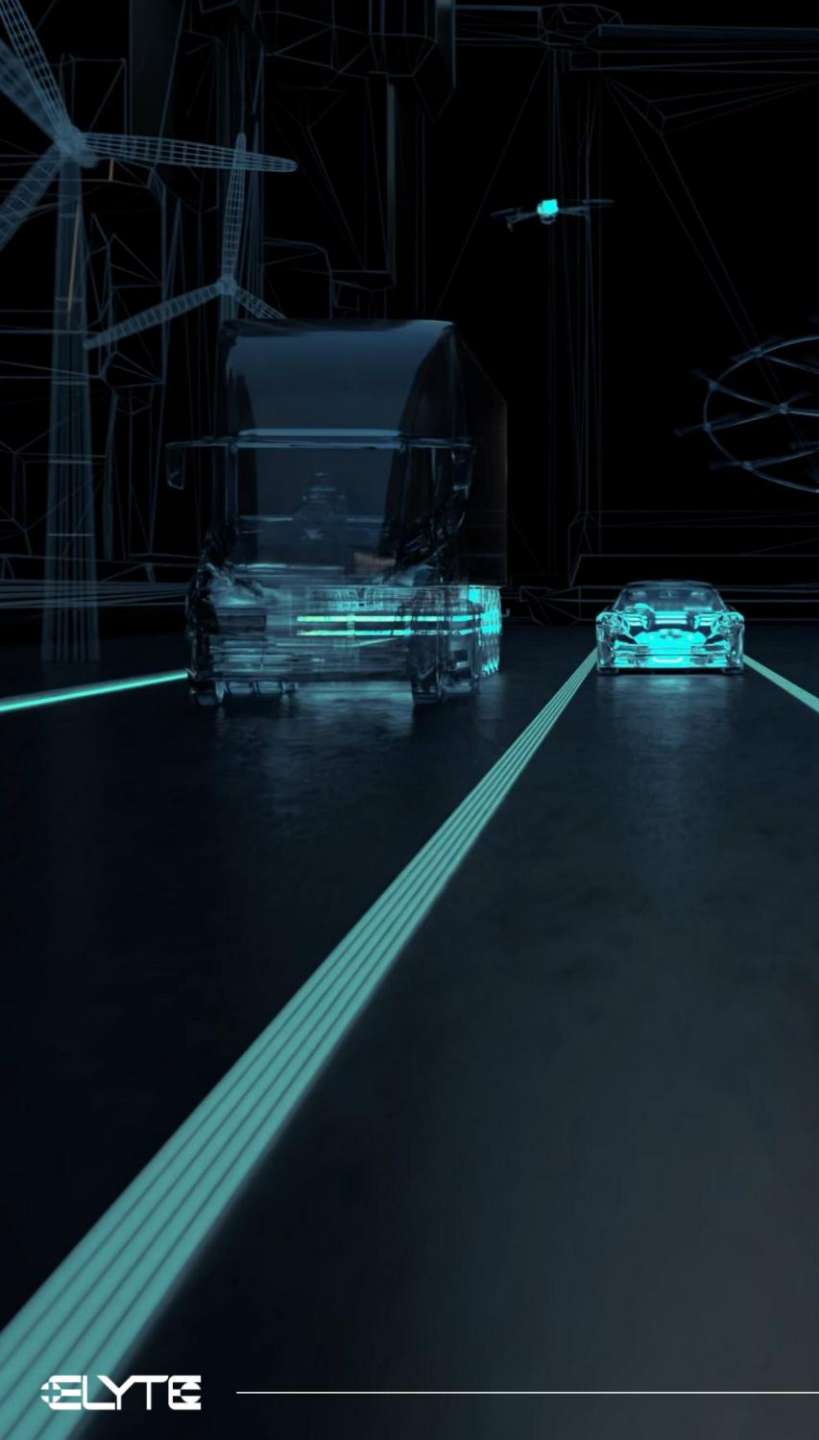


Battery recycling conference

# From waste to value through the sustainable recovery of electrolyte components

17.06.2026





**E-Lyte develops and produces  
the perfect electrolyte solution  
for each energy storage system.**

Our mission

*Solutions to power the future*

# E-Lyte at a glance

## No. 1 in Europe

European full-service partner for electrolytes.  
European technology, ownership and workforce.

## 2 Locations

**Manufacturing:** Kaiserslautern  
**R&D Center:** Münster (Westphalia)

## 20 kt/a

Series-production-ready & industry  
leading electrolyte manufacturing  
technology.

## Certifications

ISO: 9001, 14001, 45001;  
IATF 16949 Laboratory;  
VDA 6.3 qualified

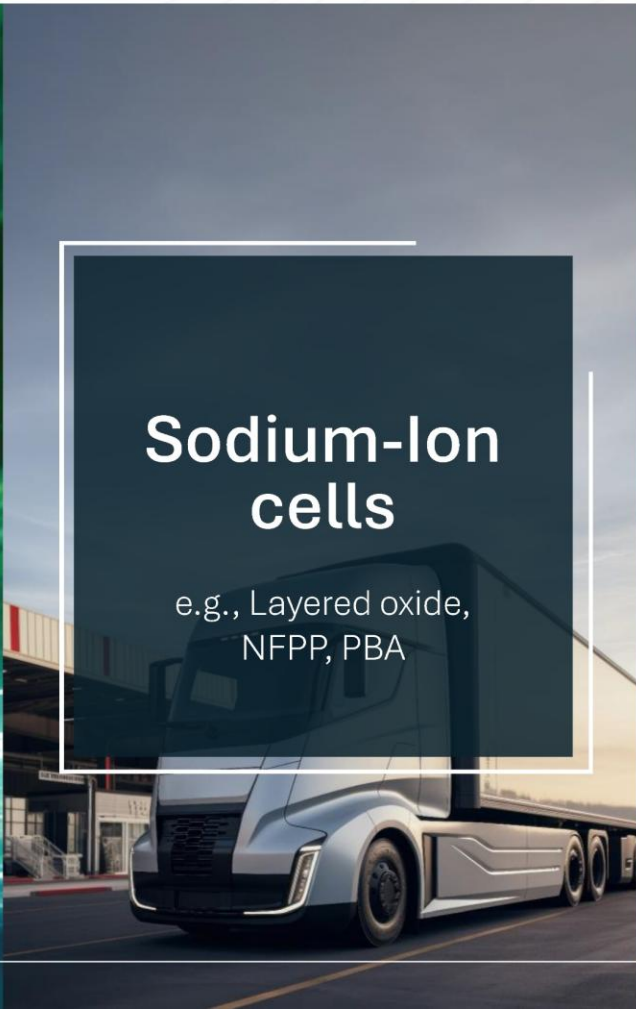


# Electrolytes for innovative cell technologies



## Lithium-Ion cells

e.g., LFP, NMC, LCO,  
LNMO, Si-rich



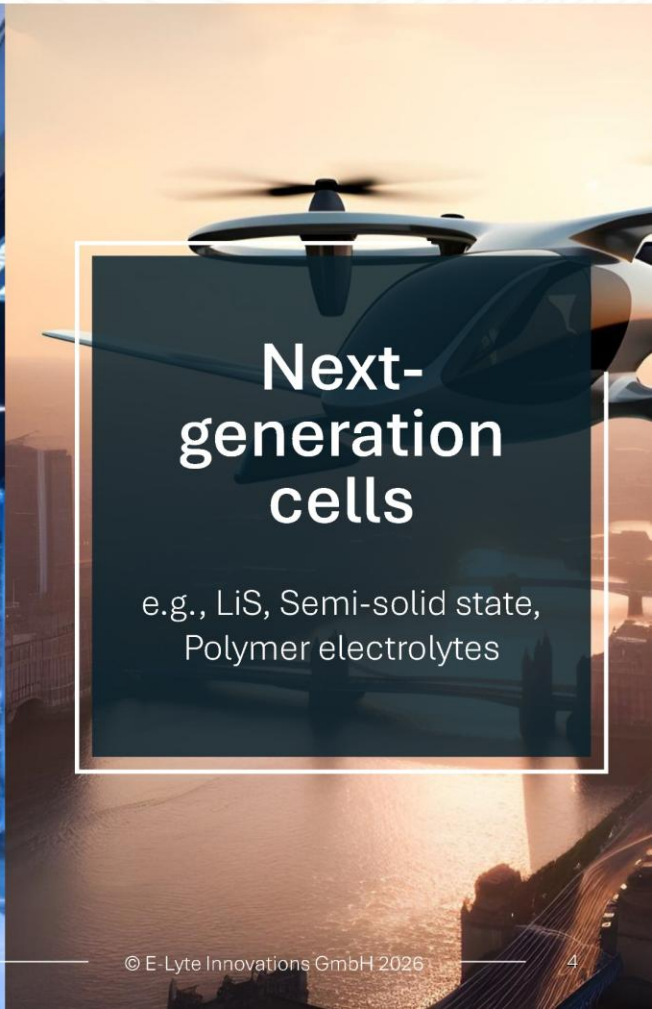
## Sodium-Ion cells

e.g., Layered oxide,  
NFPP, PBA



## Super-capacitors

e.g., EDLC, Li<sup>+</sup> Capacitor,  
Na<sup>+</sup> Capacitor



## Next-generation cells

e.g., LiS, Semi-solid state,  
Polymer electrolytes

# End-to-end electrolyte partner – from sourcing to circularity





Manufacturing

# Best in class electrolyte production process



## Innovative manufacturing

Fully automated with flexibility in volume and recipes.

## Qualified serial production process

20.000 tons/year (33 GWh cell capacity), VDA 6.3 qualified.

## Most resource efficient

Proven world's most resource-efficient manufacturing.

## Low cost, premium quality

Premium-quality at competitive manufacturing costs through full automation.



Challenge

# Customers' individual cell designs and chemistries



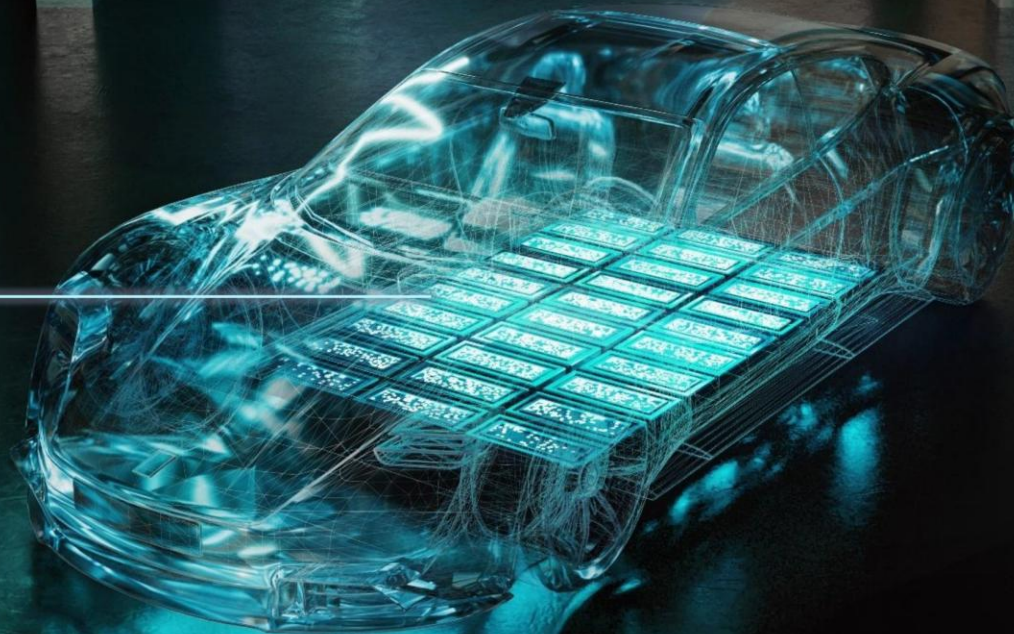
Energy · Chemistry · Safety · Cost · Charging · Lifetime · Power

Made possible only by  
the perfect mix of:

Conducting  
salts

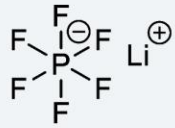
Solvent  
blend

Performance  
additives

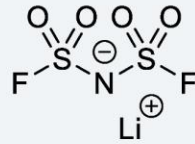


# State-of-the art components

## Conducting salts

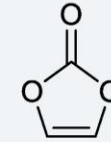


Lithium hexafluorophosphate  
(LiPF<sub>6</sub>)

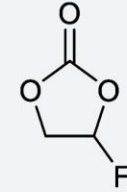


Lithium bis(fluorosulfonyl)imide  
(LiFSI)

## Performance additives



Vinylene carbonate  
(VC)

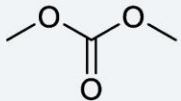


Fluoroethylene carbonate  
(FEC)

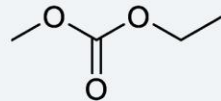
## Solvent blend

Mixed solvent approach

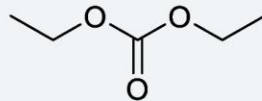
### Linear carbonates



Dimethyl carbonate  
(DMC)

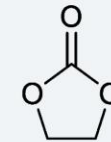


Ethyl methyl carbonate  
(EMC)

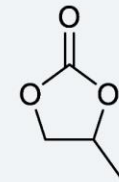


Diethyl carbonate  
(DEC)

### Cyclic carbonates



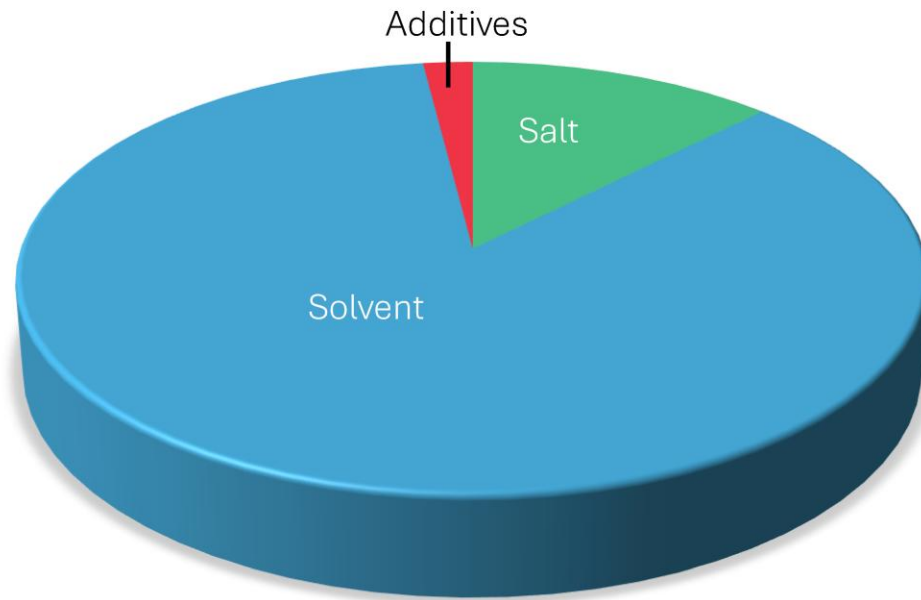
Ethylene carbonate  
(EC)



Propylene carbonate  
(PC)

# Composition in lithium-ion cells

Composition : 1.0 M  $\text{LiPF}_6$  in EC : EMC (3:7, by wt.) + 2 wt.% VC

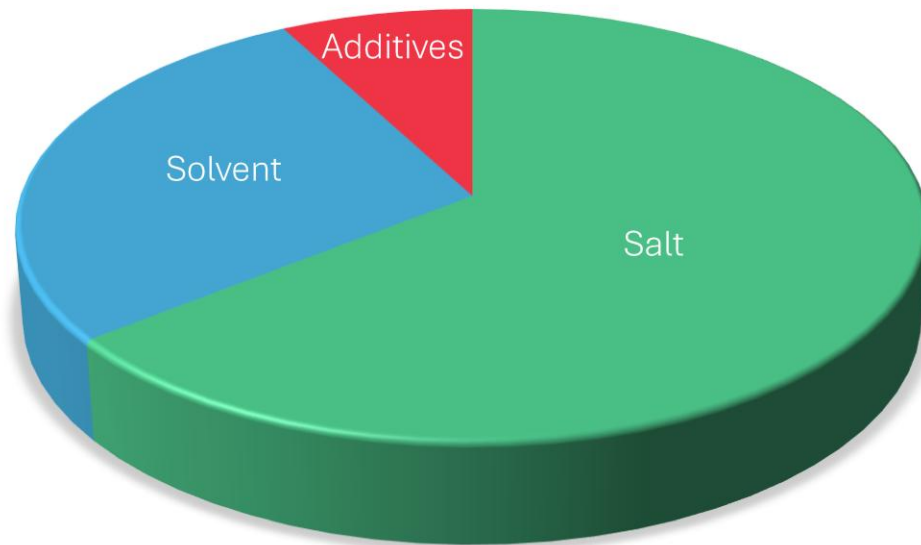


- Typical range of Li salts, such as  $\text{LiPF}_6$  is 0.8 to 1.2 molar (ca. 10 - 15% by weight).
- Solvents contribute to the largest mass fraction (ca. 80% by weight).
- Additives are only used up to ca. 5% by weight.

Electrolyte solvents contribute to the largest mass fraction!

## Cost effect in lithium-ion cells

Composition : 1.0 M  $\text{LiPF}_6$  in EC : EMC (3:7, by wt.) + 2 wt.% VC



- The electrolyte accounts to 6% of the cell costs.
- With mass fraction of <15%, the conductive salts make up 60% of the electrolyte costs, depending on the electrolyte recipe and concentration.
- Special additives and higher concentrations can significantly increase costs.

Electrolyte salts contribute to the highest proportion of the costs!

# Motivation

Funded projects:



## Improved resilience of supply chain

Local material loop - Asian supplier independence (>95% of raw material production (China, South Korea, Japan)).

## Standard routes focus on recovering metals

Solvents generally used for thermal utilization (negative for CO<sub>2</sub> recycling balance).

Recycling of salts (LiPF<sub>6</sub>) is not performed on industrial scale.

Higher safety through reduced hydrofluoric acid (HF) formation.

## Closed-Loop

Increasing number of expired electrolytes and washing solutions.

Improved recycling rate.

Compliance with EU New Battery Regulation.

Possible cost advantage.

## Improved quality of black mass

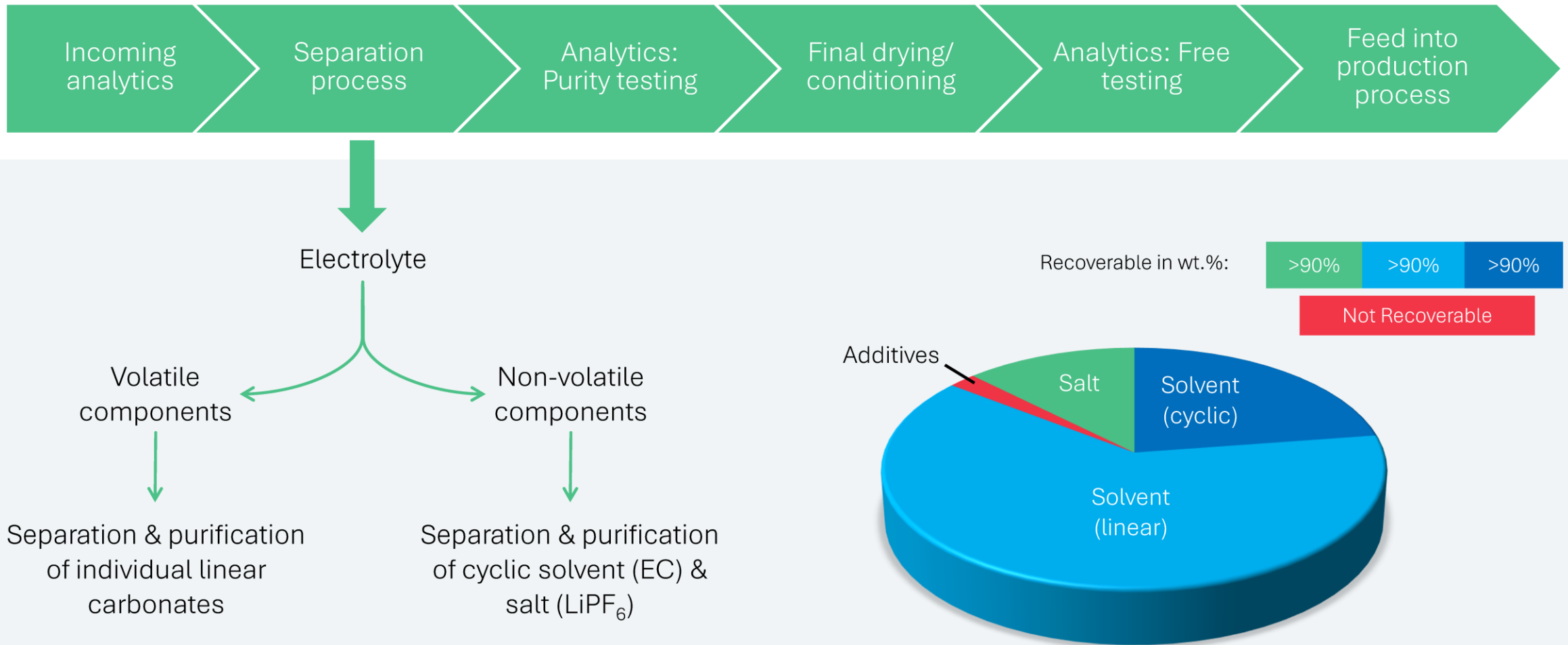
Reduction of organic components.

Reduction of fluorine residues.

## Prevention of degradation of anions

- $\text{LiPF}_6$  based electrolytes decompose at increased temperatures.
  - Formation of highly corrosive (HF) and highly toxic compounds e.g., fluoroalkyl phosphates.
- $\text{PF}_5$  as a strong Lewis acid reacts instantly with trace impurities, such as  $\text{H}_2\text{O}$  and alcohols, to form  $\text{POF}_3$  and HF.
- The purity of the solvents is critical for the stability of the conducting salt.

# Schematic electrolyte separation process



## Activities at E-Lyte



Material extraction process:

- Development of separation methods for liquid and solid components.
- Separation and purification of individual components (incl. Li-salts).
- Use of secondary components in electrolyte production and benchmarking vs. primary components.

Successfully demonstrated: separation and purification of linear carbonates as well as EC and LiPF<sub>6</sub> in high purity and yield!



*E-Lyte as #solutionmaker*

# Our Comprehensive Capabilities

- Requirements for electrolyte components - handling, purity and safety.
- Detailed understanding of the physicochemical behavior (solubility, stability, interactions) of the electrolyte components.
- Strong analytical expertise - identifying impurities.
- In-depth experience with the purification and refinement of components and mixtures - from analysis to reuse.
- Support to make solvent condensates usable for reuse in cells.
- Material-electrolyte compatibility studies (e.g., of plastics, rubber seals).
- Benchmarking projects (e.g., cell test with secondary vs. primary components).

# Contact

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## **E-Lyte Innovations GmbH**

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48149 Münster, Germany





Backup slides



# Analytics



## Ion chromatography

- Conducting salt concentration.
- Determination of anionic impurities.

## Gas chromatography

- Purity analysis of solvents.
- Control of electrolyte composition.

## Viscosity determination

## Titration for determination of free acid

- HF determination in electrolytes and raw materials.
- $\text{HBF}_4$  determination in electrolytes and raw materials.

## ICP-OES

- Conducting salt concentration.
- Determination of elemental impurities.

## Karl-Fischer titration

$\text{H}_2\text{O}$  determination in raw materials and electrolytes by coulometry.

## Determination of color/turbidity value

## Conductivity measurement

Determination of ionic conductivity of electrolytes.

## Flash point

Determination of flash point of electrolytes & raw materials (range: - 30 °C to 130 °C).

# Supporting services

## Workshops

on electrolytes, compatibility studies, and performance optimization.

## Compatibility studies

for gasket and sealing material manufacturers.

## Post-mortem

Diagnosis and interpretation of degradation mechanisms of battery electrolytes.

## Benchmarking studies

for electrolytes and battery components, from raw materials and additives to finished solutions.



# Services

## Workshops on electrolytes

- Bridging theory and practice
- Experience next-level techniques
- Shaping the future of battery technology
- Economic relevance

## Market intelligence

- Sealing materials are critical components in battery systems
- Safety and longevity through material resistance
- Performance stability over time
- Reducing environmental risk
- A key step in battery design and manufacturing

## Consulting

- Understanding the role of electrolytes in battery health
- Accurate diagnosis drives design improvement
- Applicability across different battery cell chemistries

## Benchmarking studies

- Accelerate the entry into the battery markets
- Get direct access to end customer
- From research to real business with full cycle expertise: cell testing, analytics and post-mortem analysis.
- Production of prototype cells