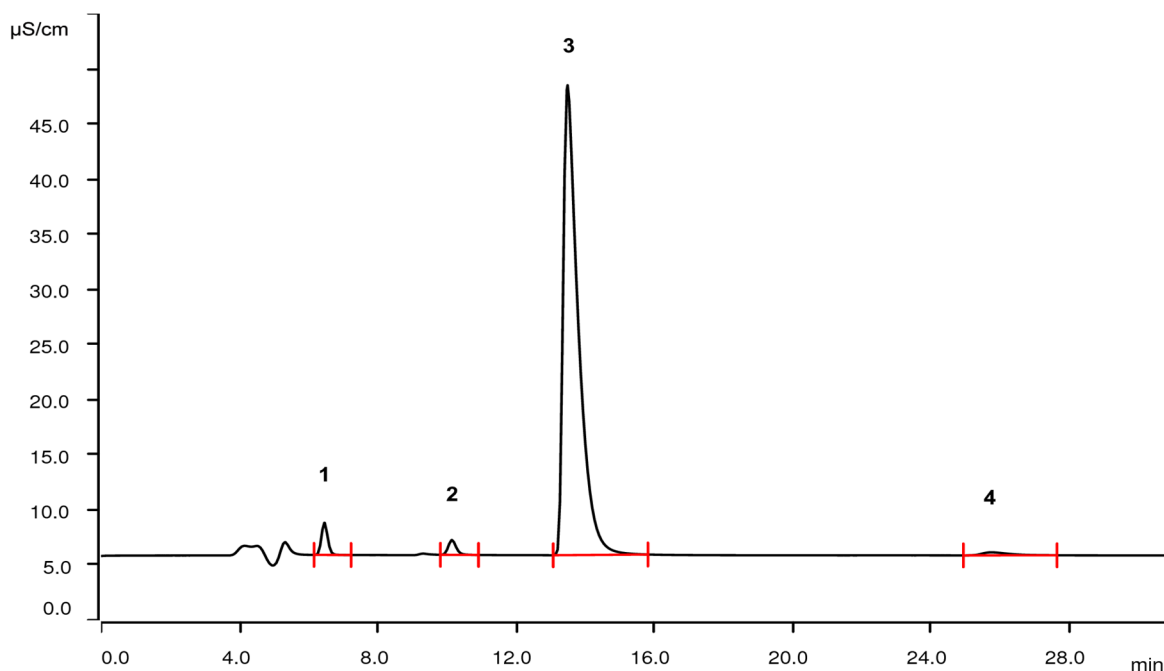


Composition of lithium salts in battery electrolyte



Lithium-ion batteries (LIBs) are the most common type of rechargeable batteries. The lithium ion is responsible for charge transfer within these batteries. Lithium hexafluorophosphate (LiPF_6) is the main conductive salt used in LIBs. However, LiPF_6 tends to decompose at elevated temperatures, or it can react with traces of water to form toxic HF. Therefore, lithium borate salts or imide-based lithium salts are added as supplements to the electrolyte to improve its performance.

With ion chromatography (IC), it is possible to quantify the amount of different lithium salts by determining the anion concentration in the different salts. The anions are separated on a Metrosep A Supp 5 - 250/4.0 column and detected by applying conductivity detection after sequential suppression.

Results

	Anion	Concentration [%]
1	Difluorophosphate (PO_2F_2)	0.24
2	Difluoro(oxalato)borate (ODFB)	0.27
3	Hexafluorophosphate (PF_6)	12.1
4	Di(fluorosulfonyl)imide (FSI)	0.31

Sample

Battery electrolyte

Sample preparation

0.4 g of electrolyte is dissolved with ultrapure water to 100 mL. Direct injection after thorough mixing.

Columns

Metrosep A Supp 5 - 250/4.0	6.1006.530
Metrosep A Supp 5 Guard/4.0	6.1006.500

Solutions

Eluent	14.0 mmol/L sodium carbonate 40% acetonitrile
Regenerant	100 mmol/L phosphoric acid
Rinsing	Ultrapure water

Instrumentation

940 Professional IC Vario ONE/SeS/PP	2.940.1500
IC Conductivity Detector	2.850.9010
858 Professional Sample Processor	2.858.0020
MSM-HC Rotor A	6.2832.000

Analysis

Conductivity detection after sequential suppression

Parameters

Flow rate	0.6 mL/min
Injection volume	20 µL
P _{max}	15 MPa
Run time	30 min
Column temperature	25 °C

