

SOLID-STATE BATTERIES MATERIALS ANALYSIS

Impurities | Composition | Stability

Composition Analysis



Avio® 220 Max NexION® 1100

In conventional batteries, cathode active material is composed of Layer Oxide Materials (NMC, LMO, LCO, LFP) with different stoichiometry and metals. Inorganic analysis is essential to determine impurities and relative ratios of the different elements.

LA/ICP-OES Analysis of Cathode Material Using NexION 1100

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Impurities Analysis



Avio® 550 Max NexION® 5000

Anode active materials are normally comprised of Lithium metal. Impurities can affect stability and electrochemical properties. ICP-MS is therefore essential for the detection of very low levels of impurities in Li materials.

Determination of Impurities in Lithium Materials with the NexION 5000

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Thermal Stability and Composition



Pyris™ DSC 9 Spectrum 3 FTIR

Solid Polymer Electrolytes (SPEs) are conductive salts embedded in a polymer matrix (Polyethylene oxide, PVDF). Thermal analysis can determine the mechanical properties of the materials (with DMA 8000) the stability of the SPEs and the presence of unbound electrolytes/monomer. FTIR spectroscopy is used to study the final material molecular structure and determine the presence of impurities and unreacted reagents.

TMA and STA to Optimize the Sintering Process of Solid-state Electrolytes

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Thermal Stability Analysis



Pyris™ TGA 9 Hyphenated Solution TG-GCMS

Glass-ceramic sulfides $\text{Li}_2\text{S-SiS}_2$, $\text{Li}_2\text{S-P}_2\text{S}_5$ known as Thio LISICON materials require thermal stability analysis. DSC analysis gives control over the crystalline phase of the precursor and final materials. ICP-MS determines Li impurities in the final materials. Thermal and evolved gas analysis evaluates the stability in the air of the materials.

Degradation of Solid Electrolytes with TG-FTIR-GCMS

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Composition Analysis



NexION® 2200

Inorganic Electrolytes contain **Perovskite and Metal Garnet** materials. The general formula of garnet is $\text{M}_3\text{N}_2(\text{SiO}_4)_3$ with the addition of filler such as Al. ICP-OES and ICP-MS are valuable techniques for the analysis of stoichiometry and the surface composition with LA.

NexION 2200 ICP-MS Flyer

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