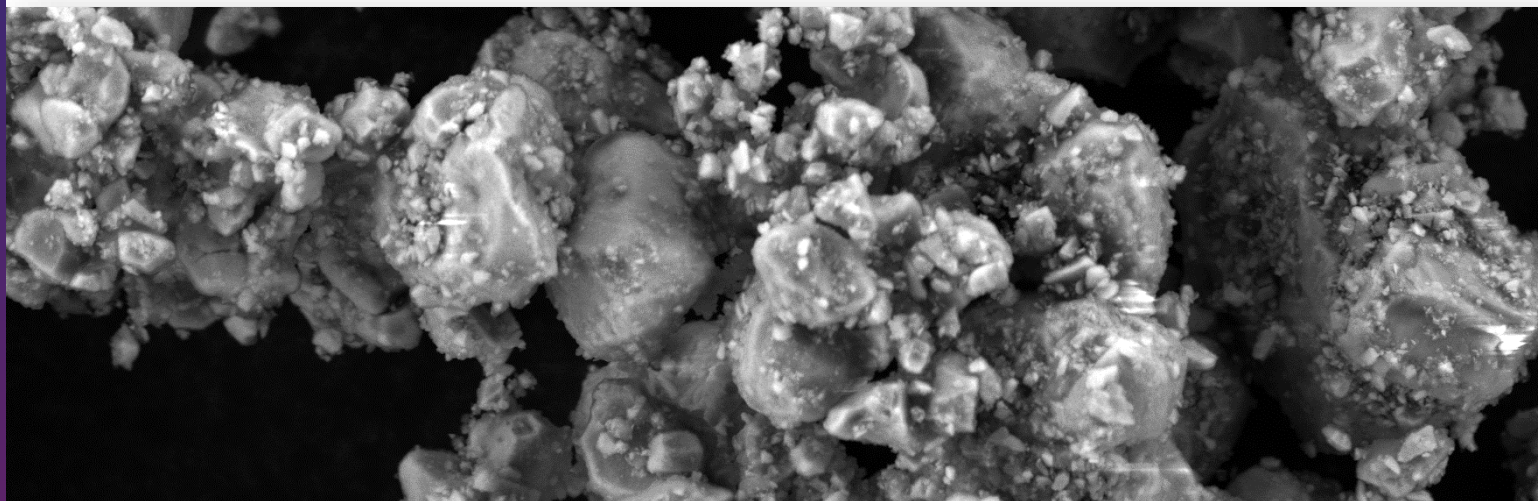


# Lithium Lanthanum Zirconium Oxide

High purity solid-state electrolyte for next-generation battery technology

## Product Brochure





William Blythe Ltd has developed a **proprietary precipitation process** to produce a range of garnet-type doped lithium lanthanum zirconium oxide (LLZO) materials for solid-state battery technology.

Key features of the process:

- Scalable to kilo-tonne quantities
- Known manufacturing technology
- Uses readily available raw materials
- Produces high purity material with a variety of dopants

As a supplier of chemicals to the pharmaceutical and semiconductor industries, William Blythe Ltd has the manufacturing capabilities and quality control protocols to deliver products with rigorously defined chemical and physical properties.

## **Doped-LLZO Product Now Available for Sampling**

Samples of doped-LLZO are supplied as a white powder to a requested particle size distribution and chemical composition. To find out more, please contact:

**Tom Kocovic**

**United Mineral and Chemical Corp.**

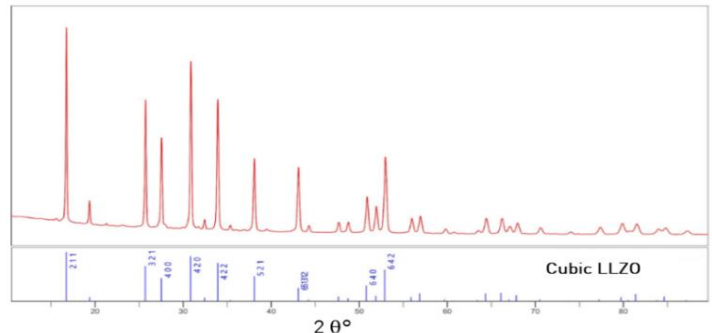
**Email:** [tkocovic@umccorp.com](mailto:tkocovic@umccorp.com)

**Phone:** 646-725-6868

## Crystal Structure

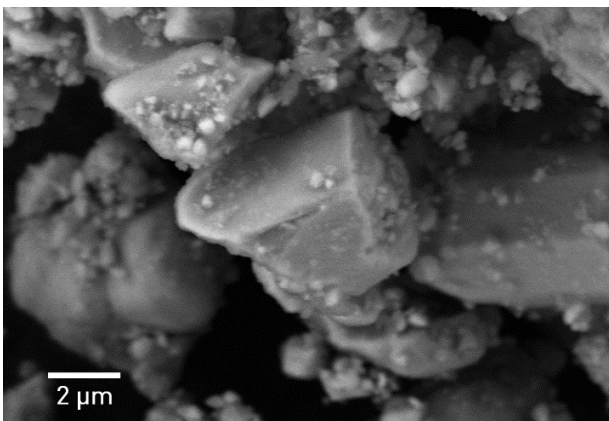
Dopant metal ions are required to stabilise the cubic phase (space group  $Ia-3d$ ) of LLZO that exhibits high Li-ion conductivity. The precipitation process enables easy incorporation of the dopant by solution-based mixing.

Where specific dopants are required, our process can be tuned to match customer needs.



The above XRD pattern is representative of a cubic LLZO material enabled by doping, in this case using niobium as the dopant.

## Particle Morphology and Size



SEM of the Cubic LLZO material.

Control of particle size is essential for producing a uniform and dense solid-electrolyte layer. The upper, lower and average particle size must be optimised for properties such as:

- Layer thickness and mechanical stability
- Grain boundary resistance
- Packing efficiency

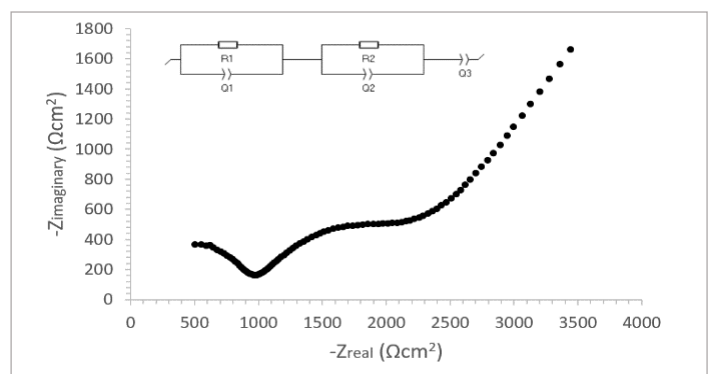
William Blythe Ltd has extensive experience in tuning particle size distributions for customers in the Polymer Additives, Pigments and Catalyst markets.

## Electrochemical Analysis

William Blythe Ltd has its own Energy Storage Laboratory with the following capabilities:

- Coin cell and pouch cell production
- 200-channels for electrochemical testing
- Solid-state electrolyte conductivity
- Climate chamber

Testing protocols can be developed with customers to define the required QC specifications.



Nyquist plot of niobium-doped LLZO.



## William Blythe Ltd is a manufacturer of speciality inorganic chemicals and advanced materials

With significant investment in product development and production infrastructure, our business is committed to working in development partnerships with our clients.

Our ever expanding portfolio covers compounds of iodine, tin, copper, tungsten and graphene oxide used in catalysis, electronics, life sciences, polymer additives and renewable energy markets.

## Corporate Responsibility

William Blythe Ltd is a long standing member of the chemical industry's Responsible Care® initiative and is committed to sustainable chemical manufacturing and ethical material sourcing.

More information about Synthomer's sustainability roadmap and Conflict Minerals Policy can be found by clicking on the below icons:



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