Characterization of Lithium Lanthanum Zirconium Oxide (LLZO) for Structural and Phase Analysis in X-ray Diffraction for Li-ion Battery Applications

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Introduction

AIM: Characterize Doped LLZO in XRD

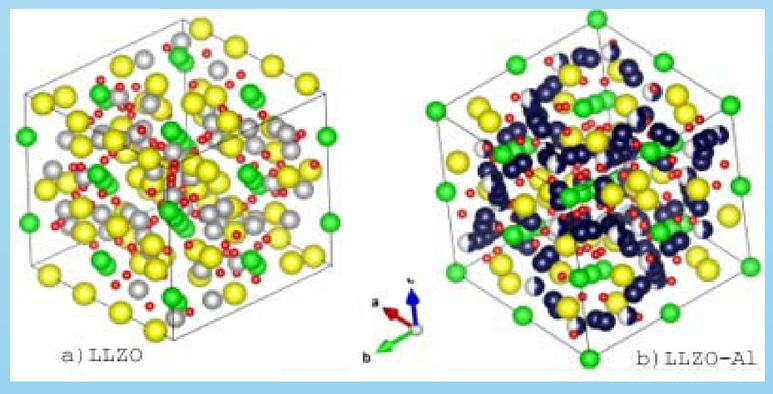
OBJECTIVE: Compare LLZO to LLZO-Al

WHY?

To study SOLID STATE Electrolyte for

Li-ion Batteries application

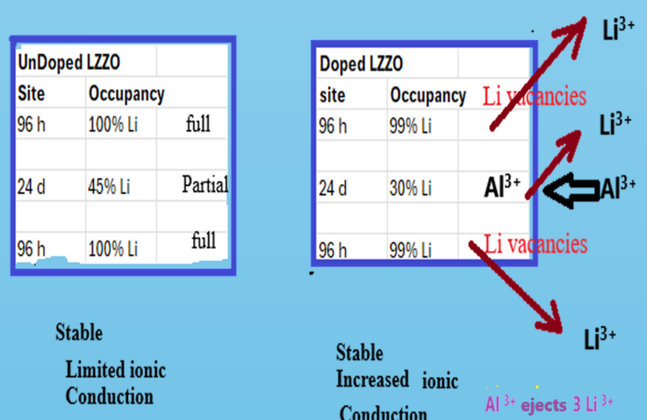
Tetragonal & Cubic phase



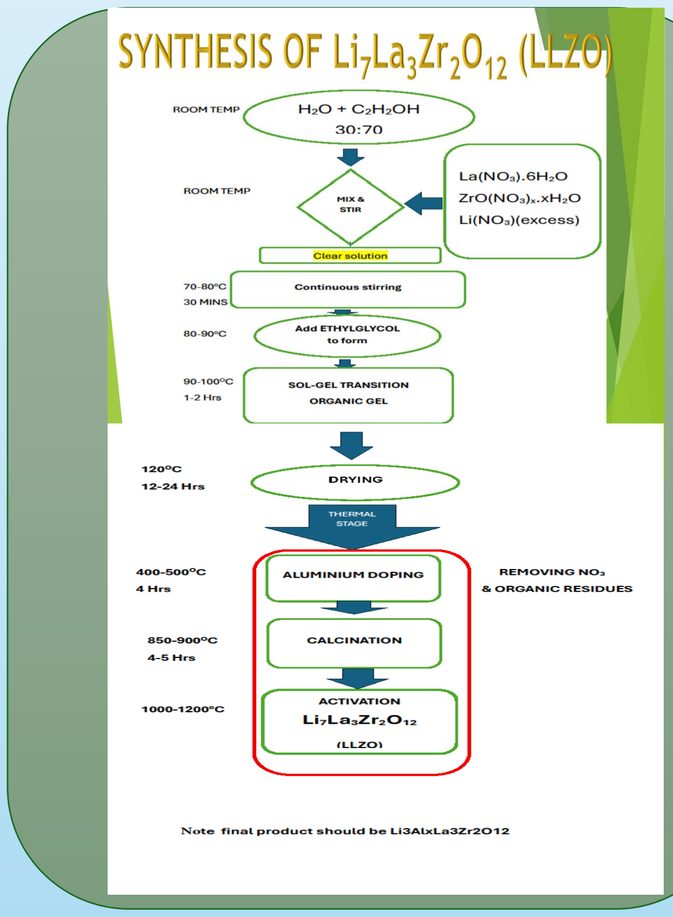
1a) LLZO 1b) LLZO-Al [5]

LLZO-Al stabilization

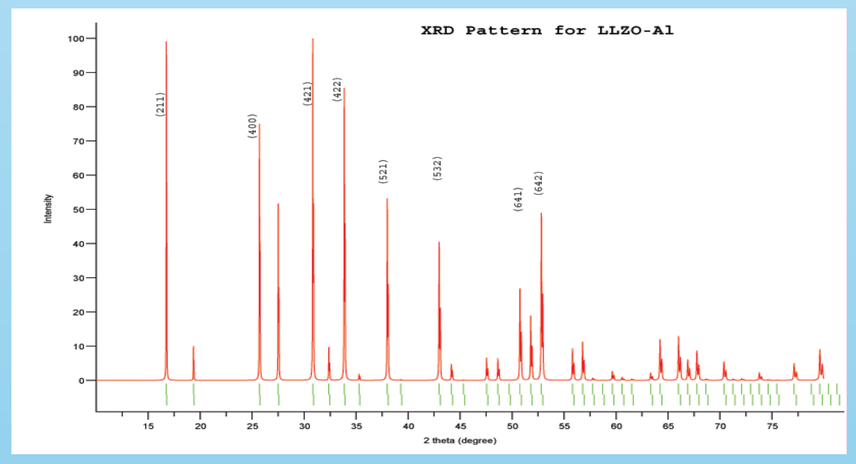
UNIT CELL



2a) Before doping 2b) After Al-doping



Results



Graph 1: XRD intensity vs 2Θ (Range = 10°- 80°)

Rp = 9.1%	X^2 = 2.3	
λ=1.54 A (Cu Kα)	2Θ Range = 10°- 80°	
Space group = I a - 3 d	Phase LLZO-Al	(230)
a=12.96Å	b=12.96 Å	c=12.96 Å
Refinement; FullProf Suite version 2024		

Table 1: Preliminary Rietveld refinement [6]

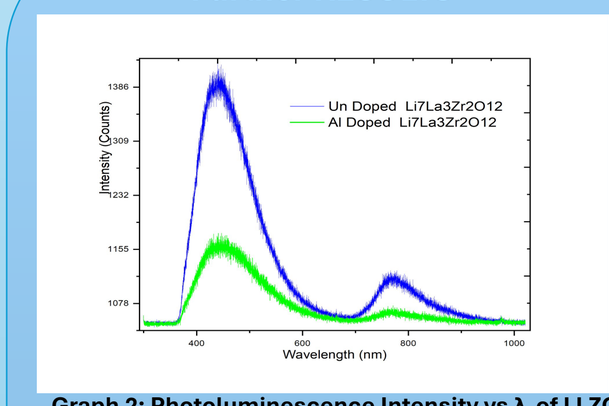
Conclusion

Al doping improves stabilization of LLZO, creating high ionic conductivity ~10^{-3}.

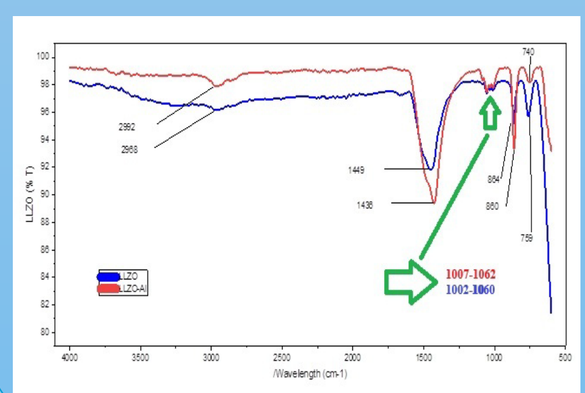
The Future:

Construction of a LLZO-Al solid-state Li-ion Battery.

Further RESULTS



Graph 2; Photoluminescence Intensity vs λ of LLZO & LLZO Al



Graph 3; FTIR spectrum of LLZO & LLZO-Al

Pic 1: Pre-Calcination Picture of synthesized LLZO

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7) .....etc

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