Rapid Fabrication of $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ Solid Electrolyte with Enhanced Lithium Ionic Conductivity by Microwave Sintering

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Traditional preparation method of solid electrolyte $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ requires a very long sintering holding time (> 36 hours). A efficient and mass production method, microwave sintering, is utilized to prepared LLZO by which the sintering time is reduced to be 2 ~ 4 h. Results show that cubic phase LLZO can be obtained at 1150 °C ~ 1200 °C. With the increase of holding time from 1 h to 4 h, tetragonal LLZO transforms to cubic which suggests extra thermal energy is generated by coupling dielectric loss with microwave. Pellet sintered with 4 h reaches the highest ionic conductivity of $3.1 \times 10^{-4} \text{ S cm}^{-1}$. Long holding time of 6 h will take away a lot of Li from the grain to form excess glass-like phase which is not favorable for conductivity.

Keywords: Solid electrolytes; $\text{Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$; Microwave sintering; Li^+ ionic conductivity

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