

Insights into NASICON Solid Electrolytes Densification via Cold Sintering Process with Sodium Ionic Salt Compositing

Tuesday, 1 September 2026 14:30 (20 minutes)

Sodium-ion batteries have recently gained attention as a sustainable alternative to lithium-based systems. However, the use of liquid electrolytes remains a major safety concern, motivating the development of solid-state alternatives. NASICON ceramics, particularly $\text{Na}_3\text{Zr}_2\text{Si}_2\text{PO}_{12}$ (NZSP), exhibit high ionic conductivity and excellent electrochemical stability, thus being strong candidates for solid-state sodium batteries. Nevertheless, conventional processing typically involves sintering temperatures above 1200 °C and long residence times, which involve high energy consumption and environmental impact.

Here, Cold Sintering Process (CSP) is proposed as a low-temperature and energy-efficient alternative for NZSP sintering. In this work, dense ceramics are obtained at 150 °C under 720 MPa, evaluating the effects of powder milling and TLP chemistry. When acetic acid is employed, the resulting samples reach higher ionic conductivity (0.50 mS/cm) compared to those processed with sodium hydroxide (0.25 mS/cm). Additional performance improvements are achieved by incorporating NaPF₆ and NaTFSI salts. Composites containing 20% NaPF₆ achieve the highest relative density (94.3%) and ionic conductivity (0.80 mS/cm). Moreover, the optimized 2h_20% NaPF₆ electrolytes demonstrate stable operation for over 500 hours in symmetric sodium cells, as well as discharge capacities of 85 mAh/g at C/2 and above 100 mAh/g at C/10 after prolonged cycling in half-cell configuration.

Professional Status of the Speaker

Postdoc

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

Author: Dr FERRER-NICOMEDES, Sergio (Universitat Jaume I)

Co-authors: Dr MORMENEO-SEGARRA, Andrés (Universitat Politècnica de València); Prof. VICENTE-AGUT, Nuria (Universitat Jaume I); Prof. BARBA-JUAN, Antonio (Universitat Jaume I)

Presenter: Dr FERRER-NICOMEDES, Sergio (Universitat Jaume I)

Session Classification: Cold sintering

Track Classification: Group 2: Cold sintering