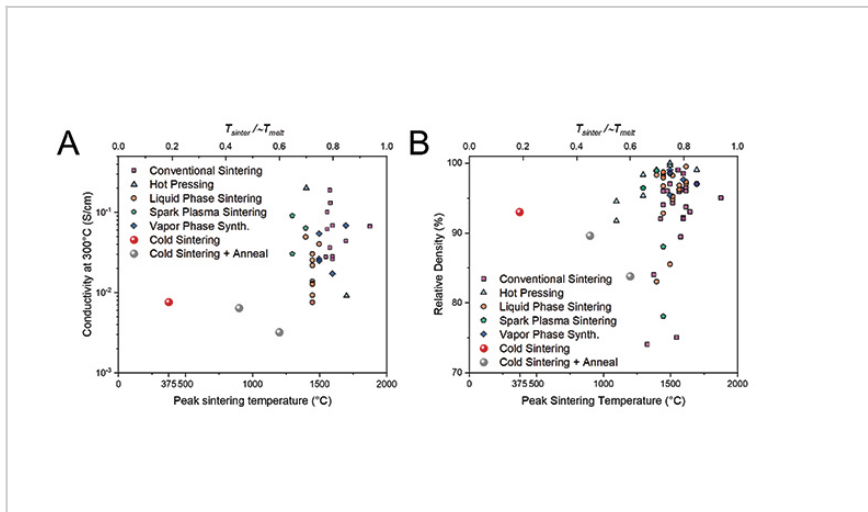


Cold Sintering Process for the Sodium Beta Alumina Solid Electrolyte

ID# 2021-5268



Comparative Processing Results for SBA

Technology Summary

SBA electrolytes are used for high temperature (>200°C) batteries. An adaption of the cold sintering (CS) process produces remarkably dense microstructures of B⁺ SBA at less than 400°C within a three hour dwell time and surpassing ninety percent of SBA's theoretical density. In addition to no significant porosity in the bulk microstructure, the results indicate very little, if any, B⁺ SBA is generated by the CS process. The sintered grains are approximately the same dimensions as the original powder, implying a lack of grain growth, thereby avoiding the exaggerated grain growth caused by conventional sintering. The ionic conductivity is competitive with conventionally fired polycrystalline ceramics at high temperature. Annealing of the CS SBA removed impurities such as carbonates and water, thereby improving the low temperatures electrical properties.

Application & Market Utility

Conventionally sintered SBA requires densification temperatures at or above 1600°C. In addition to reduced energy consumption, the cold sintered SBA may find applications in nascent energy storage technologies which need a stable solid electrolyte. The renormalization of the SBA sintering temperature from 80% of T_m to 20% of T_m may present new opportunities for co-processing this historically refractory solid electrolyte with thermally fragile electrodes for next-generation sodium-ion based energy storage technologies.

Next Steps

Scaling up sample size and making thinner samples

TECHNOLOGY READINESS LEVEL

4-7

Seeking

Licensing | Research

Keywords

- Sodium Beta Alumina (SBA)
- Solid Electrolyte
- High Temperature Battery
- Cold Sintering (CS)
- Energy storage

Researchers

Clive Randall

Distinguished Professor of Materials Science and Engineering

[Online Bio](#)

Other Researchers

Originating College

College of Earth and Mineral Sciences

Office of Technology Management Contact

Matthew Smith
mds126@psu.edu
814-863-1122



Invent Penn State is a Commonwealth-wide initiative to spur economic development, job creation, and student career success. Invent Penn State blends entrepreneurship-focused academic programs, business startup training and incubation, funding for commercialization, and university-community collaborations to facilitate the challenging process of turning research discoveries into valuable products and services that can benefit Pennsylvanians and humankind. Learn more at invent.psu.edu.

Penn State is an equal opportunity, affirmative action employer, and is committed to providing employment opportunities to all qualified applicants without regard to race, color, religion, age, sex, sexual orientation, gender identity, national origin, disability or protected veteran status.