SAND2011-8058C

Minimizing Voltage Tuning for Enhanced High Field Capacitance

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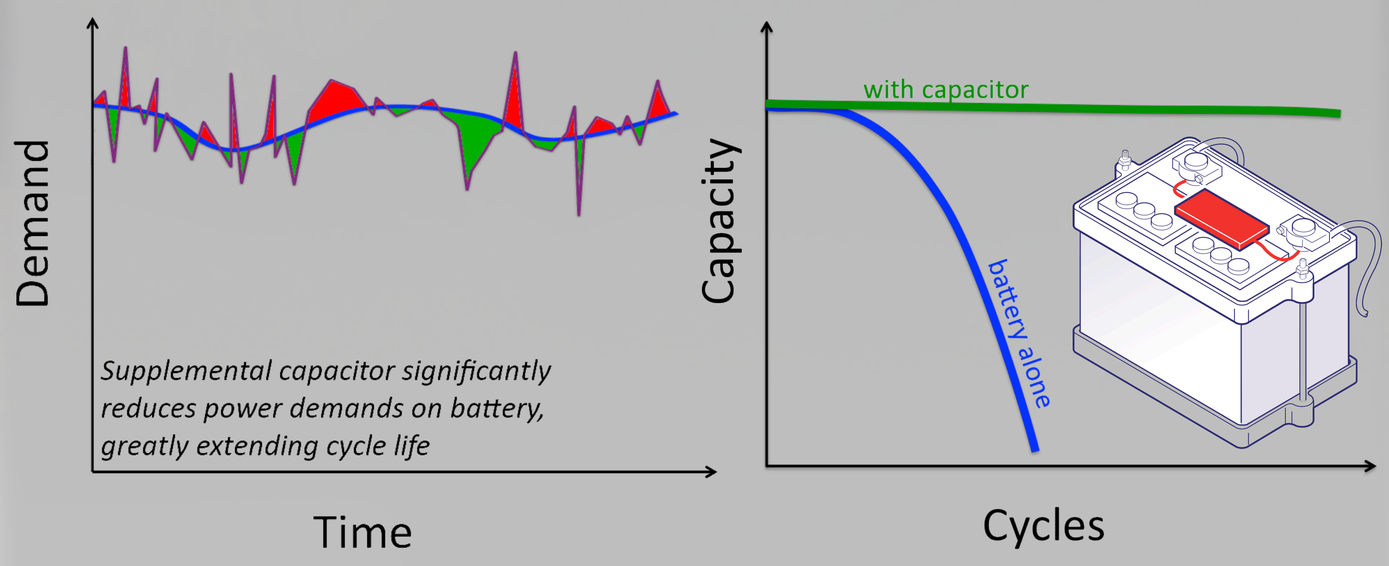
15th US-Japan Seminar on Dielectric and Piezoelectric Ceramics

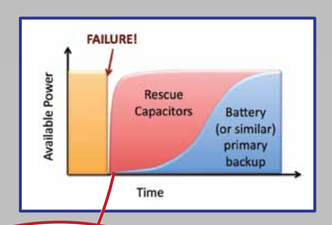
Overview

While tremendous efforts have gone into producing high-permittivity capacitors with stable response across a broad range of temperatures, relatively little work has been directed towards achieving stable capacitance under broadly varying voltages. This work aims to develop and scale up high permittivity ceramic capacitors with stable capacitance over broad temperature, voltage, and frequency ranges.

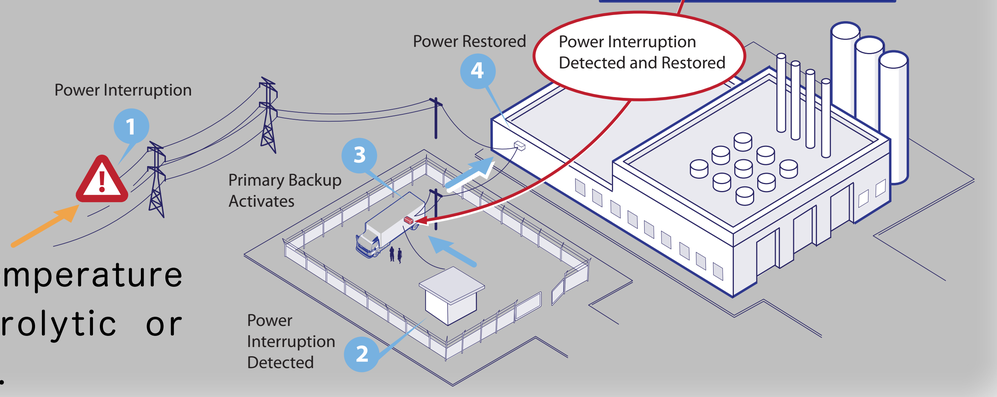
Target Applications



Faster-responding capacitors can supplement large-scale electrochemical storage to reduce power loads on UPS and frequency-regulating batteries, resulting in more efficient operation and significantly longer life.

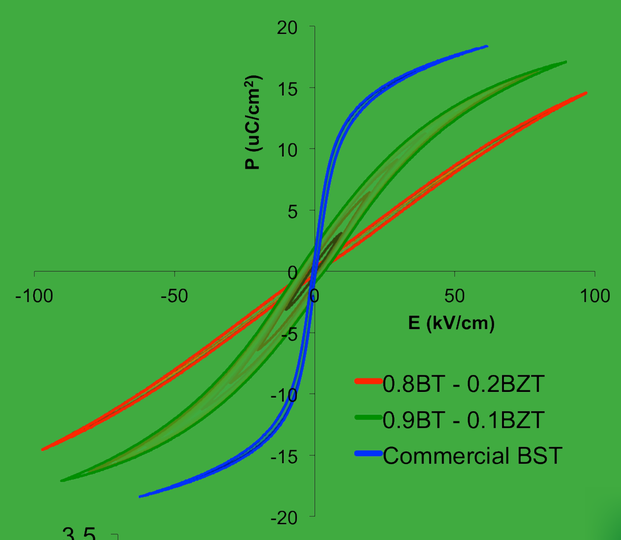


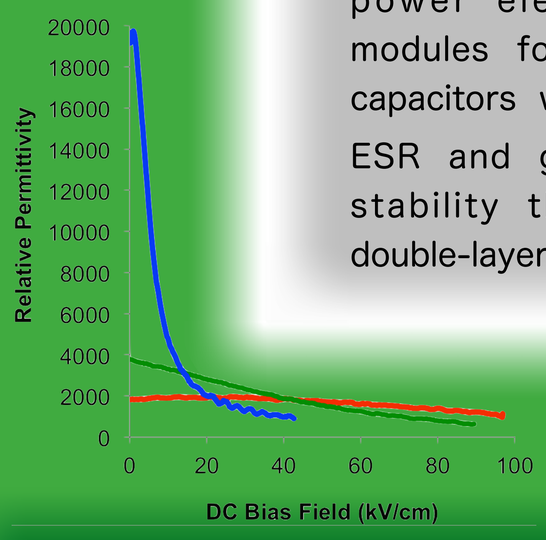
Additionally, a large need exists within power electronics modules for reliable capacitors with lower ESR and greater temperature stability than electrolytic or double-layer capacitors.

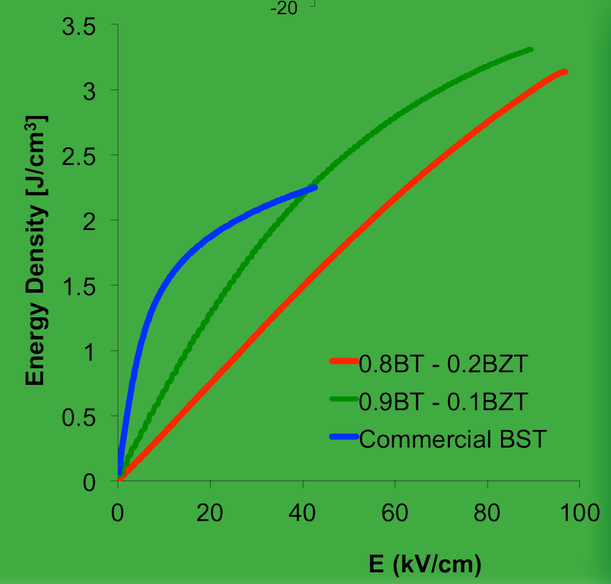


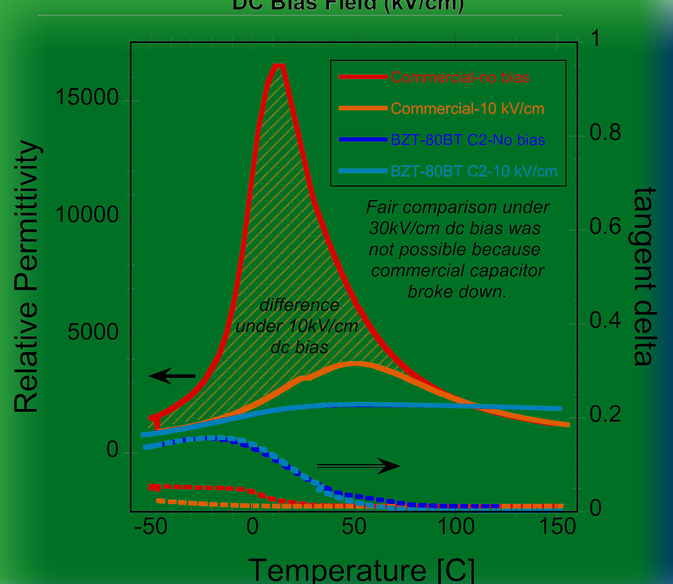
Bias Voltage Stability

BZT-BT ceramics have been fabricated which maintain relative permitivtty values greater than 1500 to fields in excess of 100kV/cm.



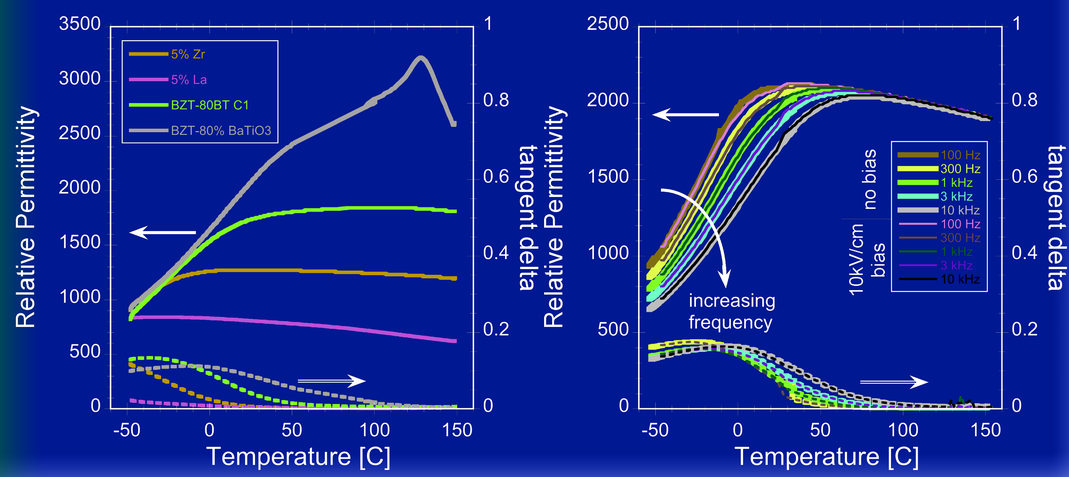




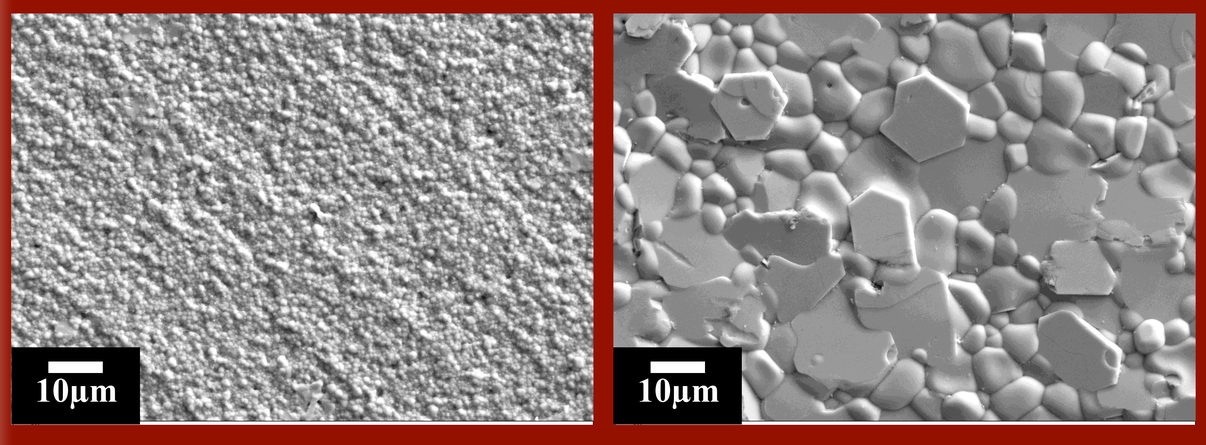


Temperature and Frequency

Temperature variation can be tailored by doping and procssing; relaxor response is amazingly stable under bias.



Microstructures and Cation Distribution



Cation mapping from SEM-EDS shows chemical heterogeneity across grains.

This work is supported by the US Department of Energy Office of Electricity's Energy Storage program. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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