

High-Energy Density Capacitors Utilizing 0.7 BaTiO₃-0.3 BiScO₃ Ceramics

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Abstract: A high, temperature-stable dielectric constant (~ 1000 from 0 ° to 300 °C) coupled with a high electrical resistivity (similar to 10¹² Ω.cm at 250 °C) make 0.7 BaTiO₃-0.3 BiScO₃ ceramics an attractive candidate for high-energy density capacitors operating at elevated temperatures. Single dielectric layer capacitors were prepared to confirm the feasibility of BaTiO₃-BiScO₃ for this application. It was found that an energy density of about 6.1 J/cm³ at a field of 73 kV/mm could be achieved at room temperature, which is superior to typical commercial X7R capacitors. Moreover, the high-energy density values were retained to 300 °C. This suggests that BaTiO₃-BiScO₃ ceramics have some advantages compared with conventional capacitor materials for high-temperature energy storage, and with further improvements in microstructure and composition, could provide realistic solutions for power electronic capacitors.