

Bismuth Niobate Thin Films for Dielectric Energy Storage Applications

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Low-temperature processed bismuth niobate (BNO) thin films were explored in this work as a potential candidate for high-energy density capacitors. The BNO samples were fabricated by the chemical solution deposition method followed by a series of ultraviolet (UV) exposure and heat treatments. A UV treatment prior to the final pyrolysis step was found to be useful in eliminating bound carbon. X-ray photoelectron spectroscopy (XPS) and secondary ion mass spectroscopy (SIMS) demonstrated that the residual carbon could be effectively removed at 350°C after UV exposure. Following a heat treatment at 450°C, the energy storage density of the BNO thin film reached 39 J/cm³ with an efficiency of 72%. Furthermore, 350°C and 375°C treated BNO samples showed high-temperature stability such that the efficiencies of the films remained above 97% up to 150°C at 10 kHz under 1 MV/cm applied field.

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