Nanocomposite Bismuth Zinc Niobate Tantalate for Flexible Energy Storage Applications

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The development of complex oxides that can be processed at temperatures at and below 350 C is desirable for their integration onto polymeric substrates, enabling their use in flexible applications. Nanocomposite films consisting of a nanocrystalline fluorite related to delta-bismuth oxide in an amorphous matrix were prepared via chemical solution deposition. These solutions were batched with the composition Bi1.5Zn0.9Nb1.35Ta0.15O6.9. The nanocomposite had a relative permittivity of 5062 and dielectric losses on the order of 0.0360.01. For measurement frequencies of 1 kHz and 10 kHz, the nanocomposite demonstrated a breakdown strength of 3.8 MV/cm, and a room-temperature energy storage density of approximately 40.261.7 J/cm3. To determine the suitability of the nanocomposite films for use in flexible applications, flexible nanocomposite films underwent repetitive compressive and tensile bending around a minimum bend diameter of 7mm, which corresponded to a strain of 0.10%. After bending the films 30 000 times, the energy storage density of the films was unchanged, demonstrating that nanocomposite bismuth zinc niobate tantalate films are suitable for flexible energy storage applications.