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Effect of Defect Dipoles And Microstructure Engineering in Energy Storage Performance of Co-doped Barium Titanate Ceramics

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Abstract : Electricity generated from renewable resources may help the transition to clean energy. A reliable energy storage system is required to use this energy properly. To do this, a high breakdown strength (Eb) and a significant difference between spontaneous polarization (Pmax) and remnant polarization (Pr) are required. To achieve this, the defect dipoles in lead free BaTiO3 ferroelectric ceramics are created using Mg2+ and Ni2+ ions as acceptor co-doping in the Ti site. According to the structural analyses, the co-dopant ions were effectively incorporated into the BTO unit cell. According to the ferroelectric study, the co-doped samples display a double hysteresis loop, stronger polarization, and high breakdown strength. The formation of oxygen vacancies and defect dipoles prevent domains' movement, resulting in hysteresis loop pinching. This results in increased energy storage density and efficiency. The defect dipoles mechanism effect can be considered a fascinating technology that can guide the researcher working on developing energy storage for next-generation applications.

Keywords : microstructure, defect, energy storage, effciency
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