

Electrical Fatigue Behavior of Li,Sb and Ta doped KNN Ceramics

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The fatigue characteristics of KNL-NSTx ceramics have been investigated. Bipolar electrical field was applied to the ceramics for up to 1×10^6 cycles. The results show that an unmodified KNL-NS sample exhibited a dramatic reduction of polarization during fatigue test. In this sample, the domain wall pinning could be induced by oxygen vacancy accumulation and leads to an inhibition of domain switching, thereby giving a higher concentration of stresses. High stress content leads to crack propagation that generates a field screening effect, hence reducing in polarization. Further addition of Ta concentration causes an increase in fatigue resistance which is due to low number of pinned domains. The unpinned domain walls give lower stress densities which in turn result in the reduction of the probability of crack formation. Small number of crack propagation results in the less field screening effect and hence greater fatigue endurance of the ceramics. The concepts of domain wall movement (domain switching) and oxygen vacancy accumulation are applied to explain why the fatigue endurance is improved after the addition of Ta into KNL-NS ceramics.