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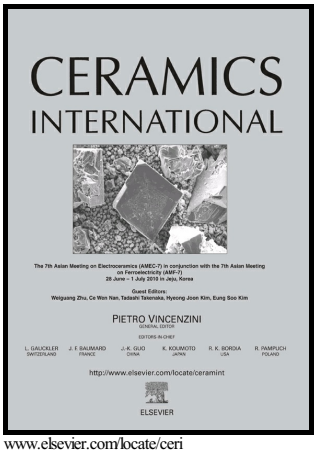

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O. Namsar, C. Uthaisar, J. Glaum, S. Pojprapai

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Orthorhombic-tetragonal phase transition induced by Ta isovalent doping and its effect on the fatigue characteristics of KNL-NST$_x$ ceramics

O. Namsar[a], C. Uthaisar[a], J. Glaum[b], S. Pojprapai[a,*]

[a] *School of Ceramic Engineering, Institute of Engineering, Suranaree University of Technology, 111 University Avenue, Muang, Nakhon Ratchasima 30000, Thailand*

[b] *Department of Materials Science and Engineering, Norwegian University of Science and Technology, 7491, Norway*

* Corresponding author. Tel.: +66 44224542

E-mail address: soodkhet@g.sut.ac.th (S. Pojprapai).

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ABSTRACT

The effect of Ta addition on the bipolar fatigue characteristics of lead-free KNL-NST$_x$ ceramics (x = 0, 0.04, 0.07 and 0.11 mol%) is studied. Bipolar cycling up to 1 x 10^6 cycles leads to strong degradation of the polarization in unmodified KNL-NS ceramics. This can be explained by the development of strong domain wall pinning, leading to the build-up of high local stresses and consequently microcracking of the material. The addition of Ta reduces the domain wall pinning effect and improves the bipolar fatigue resistance. In order to understand the fatigue mechanism, a model based on oxygen vacancy accumulation is proposed. This model is expected to guide future fatigue studies that are concerned with novel lead-free KNN-based materials.

Keywords: Fatigue; Ferroelectric properties; Perovskites; Surfaces; X-ray methods.

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