

International Conference on

Smart Materials & Structures

June 15 -17, 2015 Las Vegas, USA

Temperature dependent electrical fatigue on bulk piezoceramics

Y Mohan, Mainak Bhattacharyya and A Arockiarajan
Indian Institute of Technology Madras, India

Piezoelectric materials such as lead zirconate titanate (PZT) are a class of smart materials, which are widely used in sensors and actuators applications (e.g. aerospace, automotive and high-positioning systems etc.), due to its high electromechanical coupling. In these applications, piezoceramics may be subjected to various environments and continuous operation under complex loading conditions, which may lead to nonlinear behavior and degradation of material properties. Literature about fatigue in PZT material shows a strong dependence on the applied electric field and number of cycles. The performance of PZT also dependent on temperature, hence a proper understanding of the material performance under electrical fatigue for various ambient temperatures is necessary. In this study the commercially available PZT (PIC 151 from *PI Ceramics Corporation*) with 10 mm diameter and 1 mm thickness samples are used. The fatigue on these samples is examined under continuous operation of bipolar cyclic electric field ($\pm 2\text{kV/mm}$, 50Hz) and is exposed to an elevated thermal environment (500C, 750C and 1000C) up to 106 cycles. An experimental setup is developed to analyze the fatigue performance and to investigate the deterioration of material properties (dielectric permittivity and piezoelectric co-efficient). The output parameter such as remnant polarization, the amplitude of strain and coercive electric field from the fatigue results are analyzed. These fatigue results will be useful for material, device design using piezoceramics.

Biography

Y Mohan is a Research scholar In Department of Applied Mechanics with a specialization of Solid Mechanics at the Indian Institute of Technology Madras, Chennai, India. He had worked as a senior project assistant in National institute of ocean technology in a topic of Mechanical properties and FE modelling on syntactic foams for a period of 6 months. He did his Bachelors in Engineering with a specialization in Mechanical engineering from Anna University, Chennai, India in 2012. His current fields of interest are fatigue, damage mechanics, smart composites and material characterization of coupled-field problems.

mohany90@gmail.com

Notes: