

Large signal characterization of hard PZT materials

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Abstract

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In the last years new high-power resonant applications of piezoceramic devices like motors and transformers became more and more important. Therefore, there is a need for a better understanding of the nonlinear behavior of piezoceramic materials under driving conditions which causes large dynamical stresses.

The main problem for such measurements is the self-heating of the samples with the increasing driving electric field strength and therefore with the increasing vibration velocity. A new measuring method will be presented. The specimen are excited under constant voltage conditions in such a way that the frequency is changed step by step in vicinity of the serial resonance frequency. The excitation can be intermitted between two frequency steps to reduce the temperature rise of the specimen. The vibration velocity, the resonator current, the phase shift between the voltage and the current and the temperature can be recorded simultaneously.

Results of transverse length vibrators made of different hard PZT materials will be presented and discussed.