Ferroelectrics, 2001, Vol. 263, pp. 229–234
Reprints available directly from the publisher
Photocopying permitted by license only

Pyroelectric Sensors with Reduced Vibration Sensitivity

Bernd PLOSS, W.M. FUNG, H.L.W. CHAN and C.L. CHOY
Department of Applied Physics and Centre for Smart Materials
The Hong Kong Polytechnic University, Hung Hom, Kowloon
Hong Kong

(Received in final form August 3, 2001)

To achieve a substantial reduction of microphony in pyroelectric sensors we are proposing to replace the homogeneous pyroelectric material by a composite. The pyroelectric coefficients of polyvinylidene fluoride–trifluoroethylene copolymer (PVDF–TrFE) and perovskites like lead titanate (PT) have the same sign, while their piezoelectric coefficients d_{33} and d_{31} have opposite signs. When a ferroelectric composite is prepared by dispersing PT particles in a PVDF–TrFE matrix and the inclusions and matrix are polarized in the same direction, their pyroelectric signals reinforce while their piezoelectric signals partially or completely cancel out. Pyroelectric sensors have been fabricated by depositing this composite material on a polyimide membrane. It is demonstrated that the composite sensors show substantially lower microphony than PVDF–TrFE sensors.

Keywords: Pyroelectric sensors; piezoelectric; composites; PT; PVDF-TrFE

INTRODUCTION

All of the ten crystal classes which permit the existence of pyroelectricity are also piezoelectric [1]. As a consequence, pyroelectric detectors used in high vibration or acoustically noisy environment may produce microphonic noise signals which can be very significant [2]. Even acoustic emission due to the difference in the thermal ex-