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Fine ceramics (advanced ceramics, advanced technical ceramics) — Method for measuring the power generation characteristics of piezoelectric resonant devices for stand-alone power sources

Céramiques techniques — Méthode de mesurage des caractéristiques de production d'énergie électrique d'un dispositif résonnant piézoélectrique pour une source d'alimentation autonome

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Foreword

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This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics*.

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Introduction

Economic development is supported by infrastructure such as roads and railroads; however, maintaining ageing infrastructure at a low cost is a problem. An effective monitoring system for maintaining the health of infrastructure at a low cost is necessary, therefore a stand-alone power source is required because of requirements such as installation location, number of items and period of use. In addition, in the internet of things (IoT), power is needed everywhere in order for everything to be connected to the internet, and from that perspective a stand-alone power source is expected.

A self-supporting power source is a technology that collects energy such as light, vibration and heat, converts it into electrical energy and uses it. Power supplies for small electronic devices include those for various mobile devices, lighting switches, automotive tire-pressure monitoring systems (TPMS) and wireless sensor networks (sensor power supplies) that monitor infrastructure and the environment. The use of such power supplies is expanding to active type tags used for recognition, such as radio frequency identifiers (RFIDs). Vibratory electrical conversion using vibrational energy is considered to be easy to use because of its high energy density after sunlight. Various power generation experiments have already been conducted and its practical application has been accelerated. There are methods that use piezoelectric devices and electromagnetic induction for vibration electric conversion, but methods using ceramic piezoelectric devices are prominent because of the output voltage, device size and degree of structural freedom. The vibrations used in power generation in daily life have a wide variety of frequencies, and it is difficult to set conditions for obtaining an appropriate amount of power generation with piezoelectric devices that are highly frequency-dependent. Piezoelectric device structures are also broadly divided into cantilever (beam), plate and double-supported beam shapes, and the sizes are diversified according to the purpose and application. It is also difficult to set conditions.

Currently, the measurement of power generation performance of piezoelectric devices for self-supporting power supplies is performed by an arbitrary method. What device structure (e.g. size, structure) will be used? What kind of vibration (e.g. frequency, additional mass, displacement) is applied to the piezoelectric body? What kind of circuit configuration (e.g. output voltage, current, conversion efficiency, measuring instrument) is standardized?

For this reason, this document was created for measuring the power generation characteristics of piezoelectric devices for self-supporting power supplies.