

## Prospects for the Creation of Piezoactuators for Measurement and Control Systems of Rocket and Space Technology and Ground Space Infrastructure

**S. I. Torgashin**, *Cand. Sci. (Engineering)*, [info@niifi.ru](mailto:info@niifi.ru)

*Joint-Stock Company "Research institute of physical measurements", Penza, Russian Federation*

**I. N. Cheburakhin**, [info@niifi.ru](mailto:info@niifi.ru)

*Joint-Stock Company "Research institute of physical measurements", Penza, Russian Federation*

**V. G. Andreev**, *Dr. Sci. (Engineering)*, [info@niifi.ru](mailto:info@niifi.ru)

*Joint-Stock Company "Research institute of physical measurements", Penza, Russian Federation*

**V. V. Kikot**, *Cand. Sci. (Engineering)*, [piezo@niifi.ru](mailto:piezo@niifi.ru)

*Joint-Stock Company "Research institute of physical measurements", Penza, Russian Federation*

**V. S. Volkov**, *Cand. Sci. (Engineering)*, [info@niifi.ru](mailto:info@niifi.ru)

*Joint-Stock Company "Research institute of physical measurements", Penza, Russian Federation*

**Abstract.** The paper gives an analysis of the research results of potential technical capabilities and technological reserves of piezoceramic materials for the manufacture of macrofiber actuators. The advantages of using piezoelements to create actuators within the systems of control of rocket and space equipment and ground space infrastructure are considered. The designs, manufacturing methods, and specifications of piezoactuators based on macrofiber components are studied. It is reported that CTS-based sensors and actuators have a number of advantages: less mass, more flexibility and elasticity; wide range of frequencies; low acoustic impedance; high sensitivity, dielectric strength, mechanical and shock resistance, temperature stability; ability to make sensors and actuators of a complex shape with a large surface area; and low cost. An example of the design of the actuator made using piezofilms is presented. The paper gives the methods of making piezofilms by cutting piezoplastics, as well as employing slip casting. It is noted that the fundamental difference of the technology of resurfacing casting is that future piezoworkpieces is collected from "raw" piezoceramic films from 10 to 60  $\mu\text{m}$  thick, which consist of powder material and organic substances (bunch, solvent, plasticizer, and surfactants), providing plasticity. The electrophysical parameters of the manufactured piezocells are given, determining the possibilities of the production of piezonutrient, as well as the technical parameters of the prospective designs of the piezoactuators. It is noted that the existing scientific and technical backlog allows JSC "NIIFI" to create constructive and technological solutions for the development of piezoactuators.

**Keywords:** actuator, piezoelectric ceramics, lead zirconate-titanate, microfiber composite, slip casting