Contactless method of measuring the parameters of weak electrostatic fields (EP) in stationary and dynamic conditions

Makhmudov K.

Ioffe Institute, St Petersburg, Russia

e-mail: h.machmoudov@mail.ioffe.ru

The improved and created electrometer (EM) firstly allows to obtain new information about the physical properties of the material (glass and other solids) [1,2] and their manifestation in the field of mechanical forces. Secondly, the applied value of such studies is also important in the development of new non-destructive methods of control over defects in the structure of the material and ways to eliminate these defects [3]. Also, with the advent of chemical fibrous materials and with the increasing use of plastics in technology and everyday life, electrostatic charging processes and related technological problems and dangers are becoming increasingly important. Charge separation occurs, for example, during the flow of the fluid through the pipes when filling the tanks of airplanes and plastic petrol cans, in the swirl of dust, spray aerosols, etc. A prerequisite for the fight against electrostatic charges and to develop ways to eliminate them are measuring instruments and methods of reproduction of measured values, reflecting the effectiveness of the measures taken. As with partial discharge measurements, the use of complex and expensive instruments does not guarantee correct measurement results.

Based on the considered EM described in [3-7], a new EM scheme was improved and developed. A distinctive feature of this scheme is the use at the input of a differential stage consisting of two symmetrical field-effect transistors T1 and T2 with an isolated gate. It should be noted that, thanks to the scheme of em input circuit developed by us, the input capacitance of the amplifier has been reduced, and its sensitivity has been increased accordingly. It is two orders of magnitude higher than EM [3], and an order of magnitude higher than EM [7]. The use of the improved and created EM is capable of non-contact scanning and measuring the potential distribution of the dielectric surface EP without distortion of the signal shape under the conditions of the constant gap between the probe and the sample [8,9].

LITERATURE

1. Makhmudov, Kh. F. // Deformation and destruction of materials. 2012. No. 8. 41-45.

2. Makhmudov Kh. F. // technical physics. 2011. Vol. 81. Vol. 1. P. 76-86.

3. Miramola K. M. // the Electrification of glass and its impact strength. Diss.. kand. Phys-Mat. sciences'. L. 1991. 181s.

4. Kilkeel R. sh., Kuksenko, V. S. // Electric effects and the emergence of cracks in shchelochen - halide crystals. // FTT. 1980. Vol. 23. No. 10 S. 3133-3138.

5. Design of measuring devices . Per. with English. Ed., R. R. Krasovsky.- L.: Energy, 1967, 370 p.

6. Babacan M. J. // Research mechanoelectrical properties of rocks. Diss. kand. Phys-Mat. sciences'. M. 1988. 182s.

7. Lockner D. A., Byerly, J. D.,Kukstnko V. S., Ponomarev A. V. // PAGEOPH, 1986. V. 124. n.3. 601-608.

8. Makhmudov Kh. F., Kuksenko V. S., FIZ. 2005. Vol. 47. Vol. 5. P. 856-859.

9. Makhmudov Kh. F. // Avtoreferat Diss.. candidate of physical and mathematical Sciences . St. Petersburg, 1997.