

4.3.8. RESULTS OF EXPERIMENTAL RESEARCHES OF NANO-ELECTRODES METROLOGICAL CHARACTERISTICS FOR MEASUREMENT OF ELECTRIC FIELDS OF THE GROUND AND BIOPOTENTIALS OF THE PERSON

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Measuring of constant electric fields of the Earth spend with the purpose of detection of anomalies of an electric field of the Earth at geophysical measurements. In medicine measuring of superficial biopotentials it is widely applied to functional diagnostics of various bodies and fabrics of the person, however diagnostics on values of constants and lowfrequency potentials in an organism of the person is absent in practical public health services.

The frequency range of investigated biopotentials reaches from 0.01 Hz and above (up to 20,000 Hz at research of hearing of the person).

Not less important problem is also ecological monitoring of a condition of the Earth and socially-hygienic monitoring in public health services.

The problem consists in improvement of quality of measurement of electric constant fields of the Earth and biopotentials of the person.

Quality of measurements depends on stability of electrode potential on a direct current, contact and polarizing properties of electrodes.

Now lead electrodes are applied to measurement of constant fields of the Earth and liquid copper-zakisny. Lead electrodes are ecologically unsafe. In medicine electrodes are applied metal, silver, chlorine-silver.

Developed nanoelectrodes are based on manufacturing techniques chlorine-silver of electrodes on the basis of porous ceramics (manufacture of Tomsk Polytechnic University, Scientific Research and Development Institute of Introscopy) and modern nanotechnologies and nanomaterials.

As a result of experimental researches following metrological characteristics are received:

1) Average value of a difference of electrode potentials of system “nanoelectrode-electrolyte-nanoelectrode” during lasting many days measurements (not less than 10 day) has made 0.160 mV; the maximal deviations of potentials are equal $+\Delta_{\max} = 29 \mu\text{V}$; $-\Delta_{\max} = 16 \mu\text{V}$; среднеквадратическое value = $16 \mu\text{V}$.

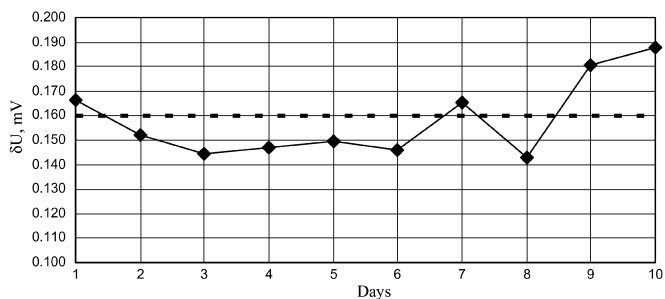


Fig. 1. Electrode potential depending on time

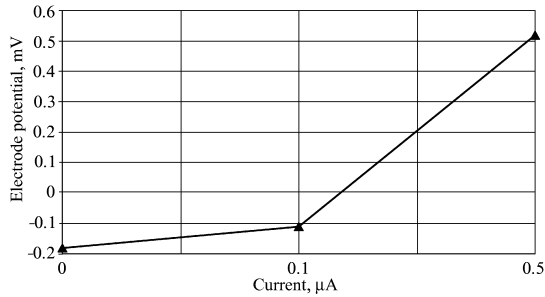


Fig. 2. A voltage of polarization of electrodes U_p depending on size of current I_p

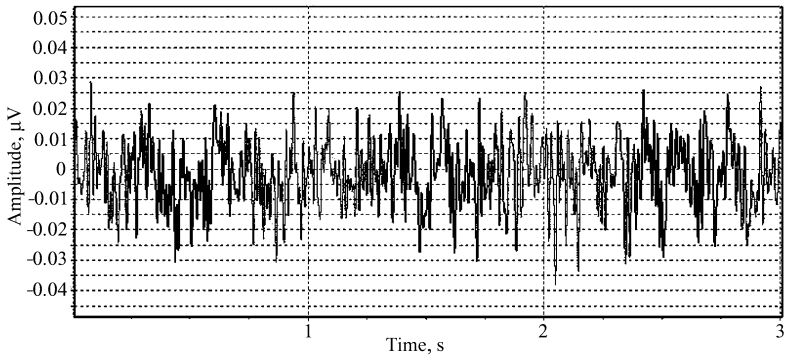


Fig. 3. Own voltage of noise of electrodes in a range of frequencies (0.05–75) Hz

- 2) Nanoelectrodes practically are not polarized at influence by a direct current $\leq 0.5 \mu\text{A}$.
- 3) The contact potentials arising on border “nanoelectrode-electrolyte-investigated a surface” make units a millivolt that allows to create the equipment with the open input, namely from a direct current, and to not apply filters of high frequencies.
- 4) Scope of own voltage of noise of electrodes makes units and tens nanovolt.
- 5) Nanoelectrodes are ecologically safe for investigated objects during long and repeated measurements.

The received results allow to draw a conclusion on perspectivity of application developed nanoelectrodes for geophysical measurements and measurements of biopotentials in medicine.