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Modeling of Temperature Dependence of Transfer Function of Molecular Electronic Transducers at Wide Temperature and Frequency Ranges

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The development of modern methods of geophysical monitoring imposes ever higher requirements on instrumental means of recording seismic signals, which poses the task of finding new technologies for sensors of primary information. Molecular-electronic technology (MET) measurers have recently become increasingly used in such areas as land and offshore seismic prospecting, monitoring of building structures, world ocean studies and even the study of medical and sport science. The advantages of modern sensors based on MET are high sensitivity, low level of self-noise combined with low production costs.

At the same time, the transfer characteristic of MET devices is determined by the type of electrolyte used, which implies that its viscosity and diffusion coefficient vary quite intensely with temperature, so the MET transfer characteristics significantly depend on the temperature. Therefore, when designing final measuring instruments, special attention is being paid to the methods of compensating the temperature drift of the amplitude-frequency response (AFR). To do this, it is essential to know precisely the behavior of the MET characteristic in the entire operating temperature range. The intricacy of its studying is conditioned by the fact that the complete transfer function is determined by mechanical and electrochemical subsystems which have a rather complicated frequency and temperature dependences.

This research represents the clear analytical model describing the temperature dependence of the AFR of the MET in the wide frequency and temperature ranges which is verified by experimental results for different types of electrolytes used in traditional MET devices.

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Biography:

Dmitry A Chikishev was born in Ulyanovsk, Russia, in 1996. He had received the B.S. degree in applied mathematics and physics from the Moscow Institute of Physics and Technology (MIPT), Moscow, in 2017. He had won grant at competition UMNIK 2017 from Foundation for Assistance to Small Innovative Enterprises (FASIE). He has been a Research Assistant with the "R-sensors" LLC, Dolgoprudniy, Russia, from 2016 to 2018. Since 2018, Dmitry has been an Engineer at Scientific and Technological Center of Marine Geophysics, MIPT. His research interests include electronics, electrochemistry, hydrodynamics, applied physics, seismology and signal analysis.