ELECTRODYNAMIC CHARACTERISTICS OF DUSTY PLASMA OF HIGH FREQUENCY TORCH DISCHARGE[1]

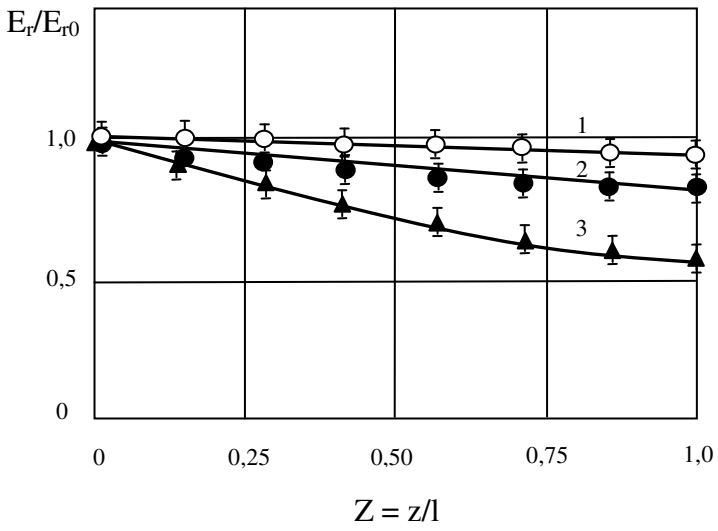
Y.Y. LUTSENKO, V.A. VLASOV***

*Tomsk Polytechnic University, 30 Lenin Ave., Tomsk, 634050, Russia, luts@mail.ru, 89069515741
**Tomsk State University of Architecture and Building, 2 Solyanaya sq., Tomsk, 634003, Russia*

High-frequency torch discharge combustion proceeds due to [1] the dissipation of electromagnetic wave energy. Therefore, characteristics of the discharge are determined by characteristics of its electromagnetic field. When using a high-frequency torch discharge for practical purposes one needs to determine its characteristics providing that condensed phase is present in the discharge plasma.

In the present article we have determined the characteristics of the electromagnetic field of a dusty torch discharge burning in air. The discharge was dusty with dielectric and conductive materials using a pneumatic batcher. The dispersibility of the powders that were used equaled 30-50 microns. Characteristics of the electromagnetic field were measured by capacitive and inductive probes moving along the axis of the discharge.

An increase in electromagnetic field attenuation along the axis of the discharge dusty with a conductive material has been detected as a result of measurements. When the discharge was dusty with a dielectric material, electromagnetic field attenuation was insignificant. Typical axial distribution of the amplitude of the radial component of the torch discharge electric field is shown in fig.1. The axial coordinate is presented in the units of discharge filament (1) length.



The axial distribution of the electric field radial component of the torch discharge, burning in the air
1 - without the condensed phase; 2 - dielectric material; 3 - conducting material

We have also conducted measurements of the wavenumber for an electromagnetic wave propagating through the plasma of a dusty torch discharge. The measurements were made by comparing theoretical profiles of radial distribution of the radial component of the electric field with experimental data. It has been proved that the wavelength decreases if the discharge is covered in dust with a conductive material.

REFERENCES

[1] *Kachanov A.V., Trekhov E.S. and Fetisov E.P. //* Sov. Phys. – Tech. Phys. – 1970. – Vol. 15.– pp. 248-252.

[1] This work was financially supported in the framework of the state task of the Ministry of Education and Science of Russian Federation for 2014÷2016 (Topic number: 2031)