

Long-lived Dusty Plasmoid

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Abstract

Study of long-lived dusty plasmoids in airflow and atmosphere is important for basic plasma physics and modeling of natural ball lightning (BL), [1].

The following tasks are studied in this work [2]:

1. Stable long-lived dusty plasmoid (LDP) creation in high-speed airflow and atmosphere by pulsed discharge.
2. Physical properties of LDP at different airflow parameters and electric discharge parameters.
3. Control of LDP's life time by additional external EM radiation.

The experimental results on LDP creation by pulse electric discharge are obtained and discussed in this work. It is obtained that the typical life time of this plasma formation is about 10÷15 seconds.

LDP's structure in airflow is studied by optical interferometer, high-speed camera and MW interferometer at the first time. The obtained experimental results will be used in a theoretical model formulation and its creation.

It is revealed that there is anomalous slow plasma-assisted combustion of dusty particles inside of this LDP. Strong electric double layer is created on the LDP's surface. It is measured strong UV radiation emitted by this LDP.

Chemical analysis of final burned dusty particles is obtained and described in this work also. It is revealed that there is complex composition of these particles.

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1. Nalivkin D., Storms and Tornados, RAS, L.1969, P.488
 2. Klimov A., Bityurin V., Tolkunov B., Moralev I., Grigorenko A., Tsimbal A., Plasma Assisted Combustion of Heterogeneous Fuel in High-Speed Airflow, AIAA-2009-1411, 47th AIAA Aerospace Sciences Meeting, 5-8 January 2009. Orlando World Center Marriott. Orlando. Florida.