Discharge Products Throttling Part for Origination of Ball Lightning with Condensed Core From the High Pressure Vapor-Gas Phase

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In the work [Emelin S.E., Semenov V.S., Bychkov V.L. et.al. Some objects formed in the interaction of electrical discharges with metals and polymers. Tech. Phys. 1997. V.42, N.3, P.269-277] within investigation of physical independent shining formations an approach to Ball Lightning (BL) experimental modeling by means of the electric discharge power-intensive plasma interaction with metal and polymer has been developed. Obtained both in stable and unstable conditions various objects as a whole showed the basic features of BL (long time of independent existence, ability to float in atmosphere, to blow up, and burn a foil), they had small sizes smaller than 1 cm and a life time in some seconds. «Skipping balls» on the basis of burning porous tin had the greatest lifetime. The greatest energy density released at burning through a metal target demonstrated the objects obtained in the volumetric discharge in softened polymer containing iron particles, and at «evaporating throttling» of the erosive capillary products through a

glass. These experiments, in particular, have proved that independent shining formations similar to BL can have the condensed core, and features of their movement can be defined by laws of the body burning in the atmosphere. Formation of this core can occur at expanding of heated viscous-liquid substance interacting volumetrically with the discharge, or by means of condensation in the conditions of high pressure maintaining during rather large period of time.

Obtaining of fire spheres by means of the electric discharge in the closed volume at parameters of the current pulse close to those of linear lightning pulses was the purpose of the present work. As a discharger we used a gap between end faces of the rod electrodes filled with tested substance Electrodes were located axially and placed in a piece of a polymeric tube. The tube was located in the metal bandage which had a short lateral hole of a small diameter for release of the discharge products into atmosphere, and electrodes were reliably fixed. The capacity storage of 3.55 mF at the greatest voltage of 5 kV had energy store of 44 kJ. For obtaining of the discharge images the digital video camera with 50 field/s was used, dynamics of the discharge current and radiation of the thrown out object was detected by means of a two-channel oscilloscope.

Researches have shown, that the break through of the discharge volume occurs to a high probability at the moment of the discharge realization, and fast outlet of products of the high pressure discharge the big pressure, leads to formation of large to 1 m in diameter and short lived fire spheres creating of the brightest flash. It shows that the throttling through a long aperture of small diameter is an essential stage of BL origination process, at the short powerful pulses of the current created by a lightning or by the short circuit.