CREATION OF BALL LIGHTNING ANALOGUES UNDER THE INFLUENCE OF CAPILLARY PLASMA GENERATORâ€™S PLASMA ON METALS

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The object with the name ball lightning (BL) has been known for a long time. Usually it is a luminous ball with a size of several cm, moving at wind speed, having a lifetime of up to several tens of seconds. Other properties that distinguish it from natural objects include high energy and the ability to explode and die with an explosion. While many properties of BL are understood based on existing models, a number of properties require the creation of models based on new experiments. As a basis, we chose a model in which the BL is a charged sphere with a shell of molecules of the composition of soil, metals, and/or water, with an internal volume filled with a gaseous or vaporous substance. Such shells can be formed when linear lightning strikes the ground containing SiO2 and Al2O3 and metal objects of arbitrary composition. The representation of the existence of the shell follows from numerous observations of the destruction of the BL, when pieces of thin material are observed from the composition of the BL surface. In this case, the shell is a thin film of a melt or solidified substance. In order to create an artificial analogue of BL (ABL), we conducted experiments on the effect of a capillary plasma generator jet on solder, aluminum, tin and copper. The energy inputted in the discharge ranged from 0.3 to 1.5 kJ. When the jet of the capillary plasma generator interacted with metal samples, compact long-lived luminous formations (ABL) were formed. When exposed to a jet of solder, aluminum and tin, ABL with unusually large dimensions up to 2 cm and a lifetime of up to 7 seconds were obtained, which consist of a core and shell and have an energy density comparable to the energy density of combustible materials, which makes them promising from the point of view of creating additives. The role of the shell formed during the formation of the hot area of the ABL is revealed. While the ABL interior contains hot steam vaporized by a jet from the solid matter, the shell consists of a quasi-solid substance, not a plasma. Steam consists of a homogeneous substance, and the shell is made of the same substance, but with the high concentration of oxides resulting from the interaction of steam with oxygen in the air. These ABL demonstrated ability to jump, roll and explode. Namely, the shell determines the elastic properties of ABL, its sphericity, the possibility of accumulating high values of the internal energy by the object and its explosion.