

# **Riddle of the ball lightning**

Mende F. F.

<http://fmnauka.narod.ru/works.html>

[mende\\_fedor@mail.ru](mailto:mende_fedor@mail.ru)

## **Abstract**

The mechanism of the formation of ball lightning is examined. It is assumed that the formation of plasmoid with the lightning stroke into the material objects is the consequence of its formation. The small mobility of ball lightning is explained by its aerodynamic properties.

Keywords: ball lightning, plasma, spectrum.

What does contribute to the formation of ball lightning? Most frequently they appear during the thunderstorm after lightning stroke. Consequently, for forming the ball lightning plasma is necessary. Specifically, this plasma in the track of lightning ensures its glow. But are formed ball lightning not frequently. It means, are necessary what that special conditions. Usually ball lightning are observed near the earth's surface. There were the cases, when they were observed with the lightning stroke into the metallic objects, for example into the crosses of church. I.e. the lightning stroke into the material object preceded the formation of ball lightning. It is natural, that with such impacts is possible the formation of plasmoid with the admixtures of the metals and other substances, that also it gives different nuances of the color of ball lightning. Further process proceeds as follows. The plasmoid of high density begins adiabatically to be enlarged, its temperature begins to fall, and radiation spectrum must be shifted to the red side. But be enlarged cluster can only until pressure in it reaches atmospheric, after this energy loss in it can occur only caused by the emission, and its sizes are stabilized. But since

energy loss caused by the emission not as rapid as with adiabatic expansion, this state can last sufficiently for long, that also is observed in practice. The stability of the ball-shaped form of the lightning it easy explain. If there is a boundary between incandescent plasma and air, with the equality the pressure on both sides of boundary, and this boundary was formed very rapidly, then it cannot rapidly resolve, since in the boundary layer the energy transfer to occur only due to the thermal conductivity of air, which is small.

There is and still one question of why ball lightning can move be transferred very to slowly and even by wind and drafts. This fact attests to the fact that despite the fact that the cluster has high temperature, its specific weight is approximately equal to the specific weight of air. This can be connected with the fact that in its composition there is substantial part from the heavy elements, which became plasma during the lightning stroke into the material object. And if its speed was great to the moment of forming the equal pressure in the cluster and the atmosphere, then aerodynamic drag will very rapidly slow down this motion.

The ball lightning of small sizes possible we observe in practice. They are formed with the sparking of electrical contacts. With this sparking of spark (ball lightning), flying away, they go out. But in this case it is easy to note that in their base, where appear sparks, their color brighter, and in the end of their motion they have red nuance. If we investigate their spectrum, then, in it will naturally be present the lines of those metals, from which are formed the sparking contacts. If the sizes of sparks are increased to the size of ball lightning, then the time of their life substantially will grow.