COLLOQUIUM

Free Floating Atmospheric Pressure Ball Plasmas

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Ball lightning is a rare natural phenomenon, there being reports over the centuries. However, because reports are scarce, and usually by lay people, there is disagreement even about the attributes of ball lightning. I will discuss the range of reports, and some of the present thinking on ball plasmas, which trend towards long-lived, low temperature dusty plasmas. In 2002 Russian scientists reported a method to reproducibly generate ball plasmas in the laboratory, and German scientists began studying them in detail in 2006. We have studied free-floating atmospheric pressure copper hydroxyl ball plasmas have been studied in air and helium atmospheres, using still and high speed photography (up to 20,000 fps), collimated photodiodes, and spectroscopy. A fine boundary layer between the greenish Cu-OH cloud, and the air, is orange in color. However, when the discharge is initiated into a helium atmosphere, the boundary layer is no longer visible, suggesting that the visible boundary was caused by interactions with oxygen. We have studied scaling of the 10-cm diameter ball plasmas with both the size of the water bucket, and the applied discharge voltage, over the range of 500-5000 volts. When looking at the initial spider-leg breakdown above the water surface, the ratio of H-alpha to H-beta lines suggests a temperature of ~0.3 eV. This is also consistent with the presence of molecular lines of OH, and perhaps CuOH2 in the rising cloud. The cloud is affected by, but can penetrate through an aluminum window screen mesh.

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4:15 P.M. (Refreshments at 4:00 P.M.)

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