dividual poles now combine to give a field momentum of $2e_0g_0/c$. Setting this equal to $\hbar$ again gives the value of g_0.

The angular momentum of a charge and a pair of poles with finite separation has a definite magnitude in the special case that the charge and poles are colinear. Then the angular momentum is $\hbar$ if the charge lies between the poles and 0 if it does not.

One might suppose that an electron could be represented by a charge e_0 and two magnetic poles $\pm g_0$. If the distance between poles is e_0^2/mc^2, a value sometimes given for the electron diameter, the magnetic moment has the correct value but the angular momentum is $\hbar$ instead of $\hbar/2$. The correct spin is obtained if the charge spends only half its time between the poles.

[1] P. A. M. Dirac, Phys. Rev. **74**, 817 (1948).
[2] H. A. Wilson, Phys. Rev. **75**, 309 (1949).

Search for the Transition of Streamer to Townsend Form of Spark in Air

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THE present view of the mechanism of spark discharge in air is that a streamer process is effective at atmospheric pressure and that a Townsend mechanism is active at lower pressures.[1] The Townsend mechanism in air may be secondary emission of electrons by positive ion bombardment of the cathode, or photoelectric emission at the cathode. There is little or no evidence to decide between these two mechanisms at low pressure, but Loeb[2] has expressed the opinion that the former is probably the predominating process. It thus may be possible to determine the transition region from the streamer to the Townsend mechanism by a study of the formative time lags of spark breakdown as a function of pressure and gap length.

Experiments were undertaken to measure these lags, using voltages as close to the static breakdown as possible. Previous measurements of formative time lags in air have been made with overvoltages of at least one percent, and usually much more.[3]

The cathode of a one-centimeter plane parallel gap was illuminated by ultraviolet light, and an approach voltage below but close to the static breakdown was applied. Then an additional small square voltage pulse (rise time 0.1 μsec.) was applied across the gap. The pulse started the sweep of a Sylvania P4 synchroscope. An electrode surrounding the transmission line to the chamber actuated the vertical deflection plates (no amplification) and thus allowed detection of the spark. The primary photoelectric current was about 50 electrons/μsec.

The results for 0.2 percent overvoltage are shown as a function of pressure in Fig. 1. These are average results. Minimum values follow a curve of the same shape, but lower at this particular overvoltage by a factor of about two. The distribution of results obtained at any given pressure and overvoltage shows that the measured lags are not statistical. The formative time lags are very long, although the lags decrease rapidly with increasing overvoltage. With an overvoltage of about one percent, the formative time lags are a small fraction of a microsecond *at all pressures* studied.

The immediate problem of separating streamer from Townsend mechanism cannot be answered. Indeed, the results obtained indicate the desirability of a general reexamination of the breakdown mechanisms when more data of this kind are available.

The ripple in the power supply (0.1 percent) prevented measurements from being made much closer than 0.2 percent above threshold. The ripple probably accounts in large measure for the distribution of results at a given pressure and overvoltage.

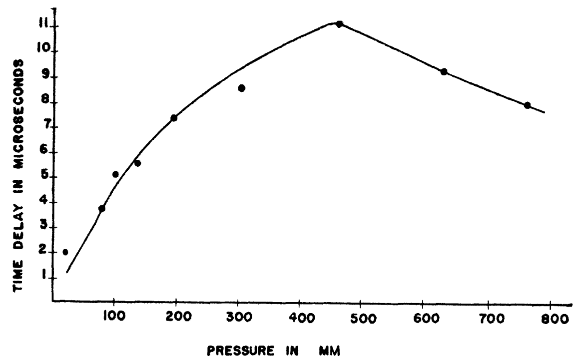

FIG. 1. Average formative time lag of spark breakdown in air as a function of pressure for 0.2 percent overvoltage in a one-cm gap.

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[1] L. B. Loeb and J. M. Meek, *The Mechanism of the Electric Spark* (Stanford University Press, Stanford, 1941).
[2] L. B. Loeb, Proc. Phys. Soc., London, **60**, 561 (1948).
[3] See for example Harry J. White, Phys. Rev. **49**, 507 (1936); Robert R. Wilson, Phys. Rev. **50**, 1082 (1936).

Decay of 8-Day Iodine^{131} to a Metastable State of Xenon^{131} *

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A RADIOACTIVE gas with a half-life of approximately 12 days has been found associated with the 8-day I^{131} produced at Oak Ridge National Laboratory. This radioactive gas is present in I^{131} preparations whether these are made from fission products or from neutron-bombarded tellurium. Removal of gas from a sample of I^{131} at intervals has shown the gaseous activity to be the daughter of a parent with an 8-day half-life. Inertness to calcium vapor indicates that this daughter is a radio-isotope of a noble gas.

Lead and tantalum absorption curves show that the 12-day activity decays with an approximately 165-kev gamma-ray as well as softer x-radiation. Tin and antimony absorption curves indicate that the x-rays are the K radiation of xenon. Lead absorption curves taken with a coincidence counter show that electrons are coincident with x-rays but not with gamma-rays. Assuming that the electrons are monoenergetic conversion electrons, the aluminum absorption curve indicates a strong component with an energy of approximately 130 kev and a much weaker component with an energy of approximately 160 kev. These energies differ from the observed gamma-ray energy by K and L binding energies of xenon.

Comparison of the electron disintegration rate of daughter 12-day xenon activity with the absolute disintegration rate of parent 8-day iodine, indicates that about one percent of the I^{131} atoms decay to this excited state of xenon^{131}. A rough calibration of the counter used for counting efficiency of 165-kev gamma-rays gives an internal conversion coefficient, N_e/N_q, of approximately 20.

The 12-day xenon^{131} isomer reported here is probably the same one that Camac[1] obtained by fast neutron bombardment of xenon. It may also be the same as the approximately 14-day xenon activity found in 0.03 percent fission yield by Chackett.[2] In a beta-ray spectrometer study of 8-day iodine^{131}, Owen, More, and Cook[3] found conversion electrons with an energy of 128 kev which were not found by Metzger and Deutch.[4] It is believed that these electrons were from the 12-day xenon daughter trapped in their source. The results reported here