of neutrons, 39 are reported to have positive moments and only two, Ag^{107} and Ag^{109}, to have negative. If the moment of P^{31} is positive, it falls near to a curve for this class of nuclei published by Latham.[10]

Finally, it is perhaps worth reporting the detection of absorption lines believed to be due to the copper nuclei in the wire of the coil of the r-f spectrometer. These show up on several runs, including ones with no sample. With a sample of solid NaBr the copper lines are identified by their positions relative to one another and relative to the much stronger Na^{23}, Br^{79}, and Br^{81} lines.[1,6] Using 4×10^{-3} cm as the skin depth, the interior of the copper wire of the coil contains about 3 percent of the stored magnetic energy. The relaxation time of the copper nuclei must be shorter than that of the Na and Br because the lines are relatively more intense than this. Therefore, it appears likely that the relaxation time of the nuclei in the metal is less than a second but greater than 10^{-4} sec. because a relaxation time shorter than this would broaden the lines, which were about 5 kc/sec. in width.

* Society of Fellows.
[1] R. V. Pound, Phys. Rev. **73**, 523 (1948).
[2] W. E. Lamb, Phys. Rev. **60**, 817 (1941).
[3] J. B. M. Kellogg and S. Millman, Rev. Mod. Phys. **18**, 323 (1946).
[4] T. Schmidt, Zeits. f. Physik **112**, 199 (1939).
[5] R. V. Pound, Phys. Rev. **72**, 1273 (1947).
[6] K. Murakawa, Zeits. f. Physik **114**, 651 (1939).
[7] G. E. Becker and P. Kusch, Phys. Rev. **73**, 531 (1948).
[8] N. A. Renzetti, Phys. Rev. **57**, 753 (1940).
[9] M. Ashley, Phys. Rev. **44**, 919 (1933).
[10] R. Latham, Proc. Phys. Soc. **59**, 979 (1947).

Conductivity Induced in Diamond by Alpha-Particle Bombardment and Its Variation among Specimens

A. J. Ahearn
Bell Telephone Laboratories, Murray Hill, New Jersey
March 15, 1948

In our experiments on conductivity induced in diamond by alpha-particle bombardment we obtain some response from most of the diamonds.[1] However, the magnitude of this response varies by a large factor. Moreover, in some individual specimens a large variation in response is obtained when the surface is scanned with a beam of alpha-particles.

Friedman, Birks, and Gauvin[2] report experiments in which only a small percentage of diamonds respond to bombardment by gamma-rays. In general, they find that such "counting" diamonds are transparent in the ultraviolet region, whereas their non-counting diamonds are opaque in the ultraviolet region. Following the nomenclature of Robertson, Fox, and Martin,[3] they classify their counting diamonds as type II, which is relatively rare, and their non-counting ones as the more common type I diamond.

Early in our work with diamond we investigated the ultraviolet transmission of a few specimens, some in which conductivity pulses were observed under alpha-particle bombardment and others in which no response was observed. Conductivity pulses were observed in all of the opaque diamonds. Among the transparent diamonds, conductivity pulses were observed in some but not in others.

Table I.

Diamond	Ultraviolet cut off in A.U.	Trans-mission diamond type	Diamond type from x-ray dif-fraction	Response to alpha-particle bombardment positive	negative
2	2980	I		X	
2*E*	2900	I		X	
2*O*	2720			X	
1	2300	II	II		X
2*F*	2300	II		X	
2*H*	2250	II		X	
2*D*	2200	II			X
2M	2100	II			X
4*A*			I	X	
3*C*	2950	I	I	X	

A few diamonds were classified as to type by means of the x-ray diffraction technique of Lonsdale.[4] All specimens classified by this analysis as type I diamonds yielded conductivity pulses. The results of these ultraviolet transmission tests, x-ray diffraction tests, and alpha-particle bombardment tests are summarized in Table I.

Thus, in contrast to the gamma-ray experiments with diamond, we conclude that with alpha-particle bombardment conductivity pulses can be induced not only in diamonds that are transparent in the ultraviolet, but also in those which are opaque in the ultraviolet. There is the possibility that diamonds may be a mixture of the two types. A specimen which is a mixture could be opaque to the ultraviolet light, but the induced conductivity might be limited to the transparent parts of the diamond.

The fact that some diamonds give no response while others give a response which varies widely, not only among different specimens but also on different parts of a given specimen, might be associated with a mixture of diamond types in a given specimen. On the other hand, these variations may be associated with the degree of crystal imperfection and its variation among specimens. The trapping of electrons and positive holes that could occur at crystal imperfections is strongly indicated by the familiar space charge effects which are observed in crystal counters.

Bombarding diamond with 5-Mev alpha-particles from polonium, pulses up to 2700 microvolts have been observed with an input capacity of about 30 micromicrofarads. Friedman, Birks, and Gauvin[2] report pulses up to 50 microvolts from the few diamonds which respond to gamma-rays. Since they did not report the input capacitance of their circuit, a direct comparison of pulse magnitudes produced by alpha-particles and gamma-rays cannot be made from these data. However, the observation that more diamonds respond to alpha-particles than to gamma-rays may indicate that the alpha-particle is the more sensitive detector of the counting ability of diamond, as might be expected from energy absorption considerations.

The author is indebted to Dr. E. A. Wood for the x-ray diffraction analysis of the diamonds and to Mr. E. K. Jaycox for the ultraviolet transmission tests.

[1] Wooldridge, Ahearn, and Burton, Phys. Rev. **71**, 913 (1947).
[2] Friedman, Birks, and Gauvin, Phys. Rev. **73**, 186 (1948).
[3] Robertson, Fox, and Martin, Phil. Trans. Roy. Soc. London **463**, 232A (1934).
[4] K. Lonsdale, Proc. Roy. Soc. **A179** (1942).