In determining the absorption curves threefold (1, 2, 3) and twofold (1, 2) coincidences were recorded simultaneously with the aluminum absorbers placed immediately in front of counter 3 (Fig. 1). The twofold coincidence rate was employed to monitor

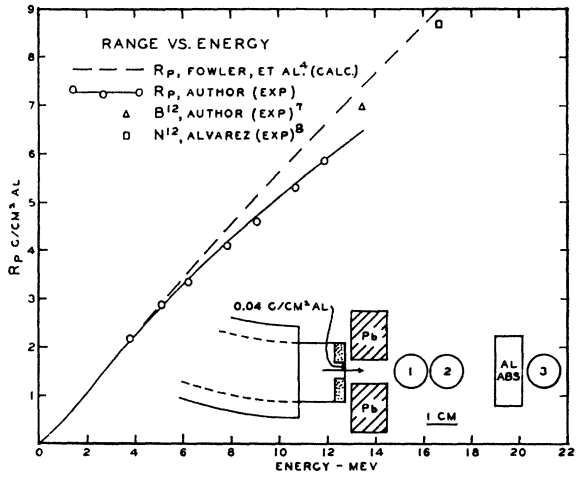

FIG. 1. The practical maximum range in aluminum (R_p) *versus* electron energy. The counter arrangement relative to the magnetic analyzer is shown in the lower right corner.

the electron beam emerging through the 0.04 g/cm² aluminum window of the spectrometer. The results yielded a family of absorption curves (corrected for counter wall thicknesses) for various electron energies selected by the spectrometer. The shape of these curves agreed well with that of computed curves[4] and the linearity near the end point allowed accurate determination of the practical maximum range. These values of R_p are shown in Fig. 1 plotted against the corresponding electron energies.

It is seen that in the high energy region the experimental points indicate a practical range somewhat less than that expected on the basis of the theoretical energy loss (dotted line). It seems likely that this may be due to two factors: (1) several cloud chamber investigations[6] have provided evidence that the energy loss of electrons traversing thin foils is greater than that predicted by theory by as much as 40 percent in the region of energy involved here, (2) multiple scattering effects have been shown to give rise to actual path lengths through absorbers which are appreciably greater than the absorber thickness.[6]

Corrected to maximum range ($R_0=R_p+0.14$ g/cm²), the solid curve should be satisfactory for energy measurements of monoenergetic gamma-rays by coincidence absorption as outlined in reference 4. However, the data do not necessarily furnish a range-energy curve suitable for end point measurements of beta-ray spectra. It is difficult to correlate the maximum range as determined here with that obtained by extrapolation of a logarithmic plot or by a Feather analysis. In this connection the end point ranges of B^{12} [7] and N^{12} [8] have been indicated in Fig. 1 plotted at energy values corresponding to the spectrometrically determined end point for B^{12} and to that expected from the atomic masses and (p,n) threshold for N^{12}. The good agreement of these points with the modified Feather formula given by Glendenin and Coryell[3] is evidence for the validity of that relation for absorption measurements of high energy beta-rays.

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[1] N. Feather, Proc. Cambr. Phil. Soc. **34**, 599 (1938).
[2] E. Bleuler and W. Zunti, Helv. Phys. Acta **19**, 376 (1946).
[3] L. E. Glendenin, Nucleonics **2**, No. 1, 12 (1948).
[4] Fowler, Lauritsen, and Lauritsen, Rev. Mod. Phys. **20**, 237 (1948).
[5] Hornyak, Dougherty, and Lauritsen, Phys. Rev. **74**, 1727 (1948).
[6] For a review of these results see M. M. Slawsky and H. R. Crane, Phys. Rev. **59**, 1203 (1939).
[7] F. L. Hereford, Phys. Rev. **74**, 574 (1948).
[8] L. W. Alvarez, Phys. Rev. **75**, 1815 (1949).

Hyperfine Structure of Te^{125}

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HYPERFINE structure in the spectrum of singly ionized Te^{125} has been observed with a Fabry Perot etalon. Using 20 mg of 80 percent enriched isotope in a water-cooled Schuler tube, photographs were obtained in three to five minutes on Eastman 103a-F plates. About a dozen lines in the region from 4000 to 6000A show hyperfine structure, all of them giving only two components. The average separation of the components is about 0.2 cm^{-1}. In some of the lines, for example λ5666, the intensities of the two components have the ratio 3:1, with corresponding displacements relative to the single component of the even isotopes. Thus it can be concluded that the spin of Te^{125} is $\frac{1}{2}$. The ratio of intensities in the line λ5708 corresponds to a j value of $\frac{3}{2}$ which does not agree with the classication $6s\ ^2P_{\frac{1}{2}}$ given by Rao and Sastry[1] for the lower level of this line.

[1] K. R. Rao and M. Gourinatha Sastry, Ind. J. Phys. **14**, 423 (1940).

Spurious Counts in Geiger Counters and the Pretreatment of the Electrodes

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GEIGER-MÜLLER counters and point counters are found under certain conditions to give spurious counts which cannot be attributed to photoelectric emission. It has been found by various observers[1,2] that newly made counters show a marked activity of this kind, which decreases with time until finally the normal background count only remains. Because of this phenomenon, various recipes for the preparation of counter cathodes have been proposed and some workers[1,2] have put forward explanations for this behavior in terms of the conditions existing on the surface of the cathode. In a recent letter to *The Physical Review*, Wiedenbeck and Crane[3] described a very interesting experiment with counters which showed nearly similar effects after having been operated at voltages above the pleateau. These authors concluded that the effect which they observed could be attributed to delayed emission of electrons from the cathode. In view of their method of pretreatment of the cathodes made from various metals (dry polishing with fine steel wool) it seems possible that a connection may exist between their observations and that of J. Kramer.[4] He maintains that the disturbances observed in newly made counters offer a new method for investigating the surfaces of metals, as regards their structure and stability. He concludes from his experiments that electrons are emitted by metals during exothermal processes.

As a result of a previous private communication of Kramer with one of the authors (S.M.N.), in which he proposed the Geiger-Müller counter or the Geiger point counter as new tools for studying metal surfaces, a series of experiments were conducted by the authors as a repetition of those by Kramer, and they were able to confirm his findings for the effects which were tried. The effects studied can briefly be stated as follows:

(1) Metal surfaces which have been ground or polished exhibit strong counting activity when placed in a counter. This activity diminishes with time according to the severity of the pretreatment and differing also in extent for various metals.
(2) On heating such a metal surface inside the counter after the activity has died down to the level of the normal background, a gradual, steep rise in counting rate may set in above a certain temperature. The behavior of the metal depends on the nature of the pretreatment, the time elapsed since treatment, and the particular metal.

Typical curves obtained by us illustrating these two phenomena are given in Figs. 1 and 2.

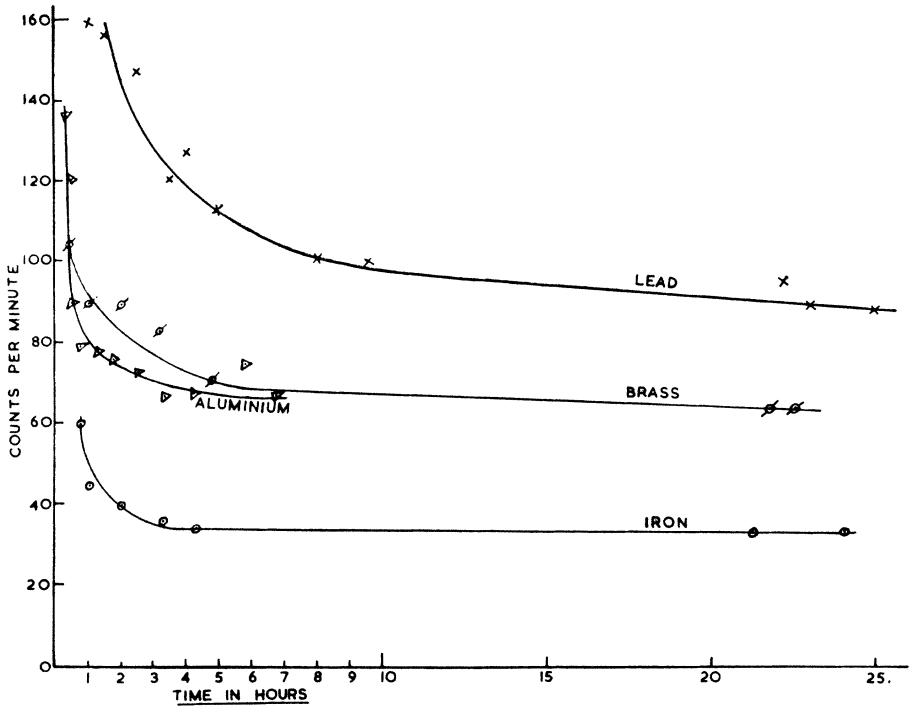

FIG. 1. Decay curves of the counting rate for sandpapered metal surfaces.

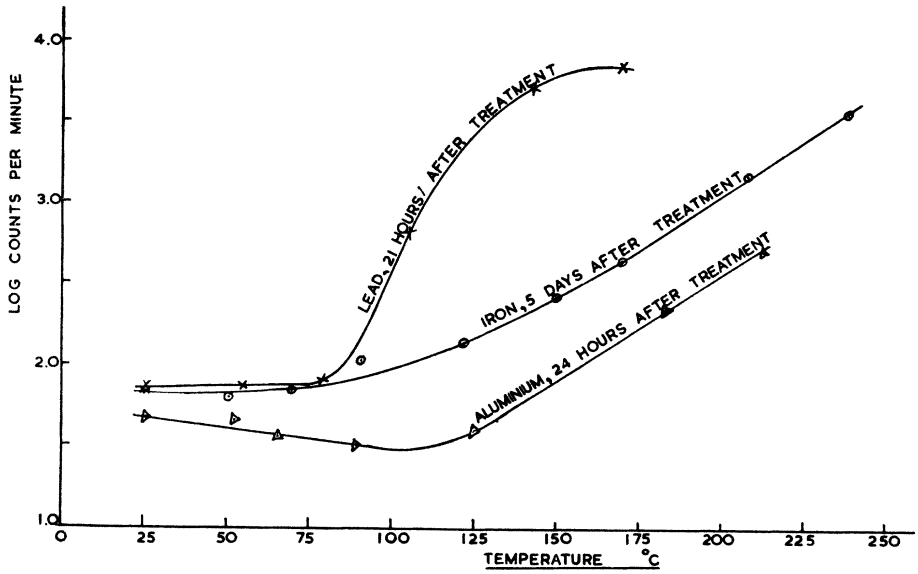

FIG. 2. The temperature effect. Metals sandpapered and tested for temperature effect after periods indicated. Tests started at room temperature.

In these experiments a glass Geiger point counter was used with a colloidal graphite cathode and a platinum point. The metal under test was placed opposite the point on a stage which was fixed to a ground glass stopper so that it could easily and quickly be removed or replaced. Provision was made for heating and measuring the temperature of the test metal inside the counter. The point was operated at a positive voltage which ranged from 1000 to 1500 volts and the cathode and test metal were earthed. The counter was filled with 9 cm argon and 1 cm alcohol vapor. Due precautions were taken against the possible effects of photoelectric emission and stray radioactivity by carefully shielding the counter by means of a lead jacket.

Work is now in progress with the object of investigating the nature of the emission causing the high counting rate. For this purpose a special cloud chamber is being constructed in which the ionizing agent sets off the cloud chamber, and in this way makes visible its own track, so that the apparatus will actually be a combination of a cloud chamber and a point counter. It is hoped in this way to identify the emitted ionizing agent, as well as to obtain a verdict on the nature of the structure of the surface layers of the pretreated metals.

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[1] W. Kutzner, Zeits. f. Physik **23**, 117 (1924).
[2] W. B. Lewis and W. E. Bureham, Proc. Camb. Phil. Soc. **32**, 503 (1936).
[3] M. Wiedenbeck and H. R. Crane, Phys. Rev. **75**, 1268 (1949).
[4] J. Kramer, Zeits. f. Physik **125**, 739 (1949).