Letters to the Editor

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Short Range Alpha-Particles from Po

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THE big alpha-ray magnetic spectrograph and the sensitive tracks method of detection, as reported in Chicago's meeting,[1] have been employed to see if there are weak groups of Po alpha-particles. Fine grain alpha-particle plates were used, the width of each plate being inclined at an angle of 30° or 45° to the incident beam. The tracks produced on a plate by the particles, which have been coming from the source, appear parallel to one another, perpendicular to the length of the plate and incident on the plate at about the same angles as expected from the disposition of the photographic plate. Only these tracks were counted with a 430× microscope. The number-energy distribution curve reveals distinctly 12 groups in the low energy region 0.04 to about 2 Mev from the main line (region lower than this was not examined). The first two groups stand out more clearly only on the curve obtained with the weakest source (see below), where the background near the main line is smaller.

Three Po sources of different strengths were used under different magnetic fields. In the various experiments, the chamber-slits were arranged differently, and different materials were used for the source-slits. The distribution curves obtained from these three sources and under the different experimental conditions are very similar to one another. The positions of the corresponding groups in the different curves agree with one another to within about 0.02 Mev. The intensities of any one group in the different curves are about in the same ratio as the relative strengths of the three sources, and the widths depend on that of the main line too. The background due to "stray" alpha-particles from the source decreases continuously and is between $\frac{1}{2}$ and $\frac{1}{5}$ of the peak intensities. From blank experiments the background, because of contamination of the chamber, was found to be only between 2 percent of the third group-intensity and zero.

The energies of these groups have been calculated by comparison with the main group, the latter taken as 5.303 Mev. These are summarized in Table I. The energy value of each group in the table represents the average of three corresponding values from three different curves, which were obtained with the three Po sources. The relative intensities were obtained after the general backgrounds were subtracted from the peak intensities, each figure also representing the average of three sources.

TABLE I. Energy of groups of alpha-particles.

Group	Group Energy in Mev	$E_n = \alpha_0 - \alpha_n$ (Mev)	Relative Intensity
α_0	5.303	0	10^6
α_1	5.113 ±0.005	0.190	(250)
α_2	5.065 ±0.005	0.238	(250)
α_3	4.901 ±0.005	0.402	150
α_4	4.838 ±0.005	0.465	110
α_5	4.749 ±0.005	0.554	130
α_6	4.640 ±0.005	0.663	104
α_7	4.449 ±0.005	0.854	116
α_8	4.303 ±0.005	1.000	70
α_9	4.111 ±0.005	1.192	75
α_{10}	4.016 ±0.005	1.287	50
α_{11}	3.890 ±0.005	1.413	40
α_{12}	3.685 ±0.005	1.618	40

If these alpha-particle groups are interpreted in the same way as the ordinary fine structure lines,[2] the differences between the main group energy and the individual group energies will give the corresponding energy levels of Pb^{206} nucleus. These are shown in the third column of Table I. In 1935,[3] Bothe found five gamma-ray lines from Po, two of them being less certain. It is possible to find transitions in our level system which agree approximately with Bothe's gamma-ray lines, but this is rather arbitrary because there are 78 possible transitions between the 13 levels. The average number of quanta, as reported in Bothe's first paper (1930), was about seven in 10^6 of the alpha-particles. Because of the method of detection used, this figure is rather uncertain.

In the high energy region of the main line (from $E_n = 0.01$ to about 2.2 Mev), no indication of any alpha-particle groups could be found. Only an extremely small background decreases continuously to zero. Details will be published elsewhere.

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[1] W. Y. Chang, Phys. Rev. **67**, 58 (1945).
[2] It is to be noted that the intensities of these groups are much smaller than those of the usual fine structure lines, and that most of them have larger energy separations from the main line.
[3] W. Bothe, Zeits. f. Physik **96**, 607 (1935).

The Nuclear Excitation of Rhodium

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A NEW activity in rhodium has recently been reported by Flammersfeld.[1] This activity was induced by the bombardment of pure rhodium metal with fast neutrons obtained from the D–D reaction. Since the activity induced was not greatly altered by the presence of small amounts of paraffin, this author suggested that the activity is caused by nuclear isomerism in stable rhodium. A half-life period