Letters to the Editor

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Disintegration of Lithium by Swift Protons

IN a previous letter to this journal [1] we have described a method of producing a steady stream of swift protons of energies up to 600 kilovolts by the application of high potentials, and have described experiments to measure the range of travel of these protons outside the tube. We have employed the same method to examine the effect of the bombardment of a layer of lithium by a stream of these ions, the lithium being placed inside the tube at 45° to the beam. A mica window of stopping power of 2 cm. of air was sealed on to the side of the tube, and the existence of radiation from the lithium was investigated by the scintillation method outside the tube. The thickness of the mica window was much more than sufficient to prevent any scattered protons from escaping into the air even at the highest voltages used.

On applying an accelerating potential of the order of 125 kilovolts, a number of bright scintillations were at once observed, the numbers increasing rapidly with voltage up to the highest voltages used, namely, 400 kilovolts. At this point many hundreds of scintillations per minute were observed using a proton current of a few microamperes. No scintillations were observed when the proton stream was cut off or when the lithium was shielded from it by a metal screen. The range of the particles was measured by introducing mica screens in the path of the rays, and found to be about eight centimetres in air and not to vary appreciably with voltage.

To throw light on the nature of these particles, experiments were made with a Shimizu expansion chamber, when a number of tracks resembling those of α-particles were observed and of range agreeing closely with that determined by the scintillations. It is estimated that at 250 kilovolts, one particle is produced for approximately 10^9 protons.

The brightness of the scintillations and the density of the tracks observed in the expansion chamber suggest that the particles are normal α-particles. If this point of view turns out to be correct, it seems not unlikely that the lithium isotope of mass 7 occasionally captures a proton and the resulting nucleus of mass 8 breaks into two α-particles, each of mass four and each with an energy of about eight million electron volts. The evolution of energy on this view is about sixteen million electron volts per disintegration, agreeing approximately with that to be expected from the decrease of atomic mass involved in such a disintegration.

Experiments are in progress to determine the effect on other elements when bombarded by a stream of swift protons and other particles.

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April 16.

[1] NATURE, **129**, 242, Feb. 13, 1932.

Isotopic Constitution of Lead from Different Sources

THANKS to the generous co-operation of Dr. v. Grosse and other chemists in supplying me with the requisite rare materials, I have been able to repeat and amplify my analyses of lead from different geological sources. During these experiments, which I hope to extend, technical improvements were effected so that, in spite of the difficulties inherent in the problem, results have been obtained upon which considerable reliance may be placed.

The effect of the presence of hydrides due to the methyl compounds has been measured and can be allowed for. Under the particular conditions used, it amounts to 2·3 per cent. Thus in the lightest lead (II) though the line 207 had an apparent intensity of 9·5 (line 206 = 100), its true relative abundance is estimated to be $7{\cdot}2 \pm 0{\cdot}3$, in good agreement with the value 7 assumed by Lord Rutherford [1] for his calculations on actino-uranium. Several rare isotopes previously suspected in ordinary lead [2] have now been confirmed but their abundances are too small to be certain. The percentage analyses are as follows :—

Chemical	I	II	III	IV
Atomic Weight	207·22	206·048	206·195	207·90
203	(0·04)	..	..	..
204	(1·50)	..	..	..
205	(0·03)	..	..	..
206	27·75	93·3	85·9	4·6
207	20·20	6·7	8·3	1·3
208	49·55	(0·02)	5·8	94·1
209	(0·85)	..	..	..
210	(0·08)	..	..	..
Mean Mass Number	207·19	206·067	206·20	207·895

I. Ordinary lead.
II. Lead from Katanga pitchblende (Hönigschmid and Birkenbach *Ber. Deutsch. Chem. Gesell.*, **56**, 1837; 1923).
III. Lead from Wilberforce uraninite (Baxter and Bliss, *J. Amer. Chem. Soc.*, **52**, 4851; 1930).
IV. Lead from Norwegian thorite (Fajans, *Sitz. Heidelberger Akad. Wiss.*, **3**; 1918).

The packing fractions of the leads will be very difficult to ascertain, but appear to be in the region 0 to +1. They will tend to cancel the correction (still uncertain) to the chemical scale, so that the mean mass-numbers should show agreement with the chemical atomic weights, which is the case. It is noteworthy that the quantities of 206 and 207 in (IV) do not correspond to those expected from ordinary lead present as an impurity.

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April 12.

[1] NATURE, **123**, 313, March 2, 1929.
[2] NATURE, **120**, 224, Aug. 13, 1927.

Oxygen and Everest

ON the interesting subject of the need for oxygen on Mount Everest, Prof J. Barcroft has made the remark, before Section I of the British Association, that the whole matter is now merely "an engineer's problem": the problem of designing a light and efficient oxygen breathing apparatus. This point of view is ably supported by Prof. Margaria.[1] There is, however, something more: namely, the disadvantage of acclimatisation in a man using such apparatus. If it is one of the 'open circuit' type, acclimatised breathing causes a huge waste of oxygen and adds correspondingly to the difficulty of transportation. Yet a man dare not relinquish this physiological condition, even if he could. For if he relinquished it, he would die of asphyxia as soon as he took the apparatus off.