Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 587.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Radiopotassium and other Artificial Radio-elements

IN a letter published in NATURE of January 19, it was shown that the bombardment of scandium with neutrons leads, beside the formation of an active scandium isotope[1] $_{20}Sc^{46}$, to the formation of a new potassium isotope $_{19}K^{42}$ having a half-life value of about 16 hours and emitting β-rays the intensity of which is reduced to one half of its initial value by an aluminium foil of approximately 0·7 mm. thickness. We were recently successful in preparing this potassium isotope K^{42} by the bombardment of calcium by neutrons according to the equation :

$$_{20}Ca^{42} + {}_0n^1 = {}_{19}K^{42} + {}_1H^1.$$

Calcium carbonate, after being exposed to neutrons produced by a mixture of 200–300 mgm. radium emanation and beryllium powder, was dissolved in dilute hydrochloric acid, 150 mgm. sodium chloride added and the calcium precipitated as oxalate. The filtrate was found to be active and the measurement of both the rate of decay and the absorption of the radiation emitted has shown the presence of $_{19}K^{42}$. The yield of K^{42} from calcium is a low one, which is due chiefly to the fact that the isotope Ca^{42} is only present to the extent of 0·8 per cent in the mixed element calcium. It is now possible to produce the potassium isotope K^{42} by each of the following reactions :

$$(1)^2 \quad {}_{19}K^{41} + {}_0n^1 = {}_{19}K^{42};$$
$$(2) \quad {}_{20}Ca^{42} + {}_0n^1 = {}_{19}K^{42} + {}_1H^1;$$
$$(3) \quad {}_{21}Sc^{45} + {}_0n^1 = {}_{19}K^{42} + {}_2\alpha^4.$$

When applying neutrons slowed down by Fermi's device by reflection by hydrogen nuclei, an active calcium isotope was obtained which decays with a period of 4 hours, the formation of which is due to one of the following two reactions :

$$_{20}Ca^{40} + {}_0n^1 = {}_{20}Ca^{41};$$
$$_{20}Ca^{44} + {}_0n^1 = {}_{20}Ca^{45};$$

the latter being the more probable one.

We investigated also the action of neutrons the velocity of which was reduced by the use of paraffin, on zirconium and hafnium, and found that the active zirconium obtained decays with a period of 40 hours, the intensity of the β-rays emitted being reduced to one half of its initial value by an aluminium foil of 0·5 mm. thickness. The disintegration of the active hafnium is much slower than that of zirconium, half of the activity acquired being lost only after the lapse of a few months. Radio-zirconium is presumably formed according to the equation

$$_{40}Zr^{96} + {}_0n^1 = {}_{40}Zr^{97}.$$

In the case of hafnium, every place between the mass numbers 176 and 180 being occupied by a known stable isotope, the formation of the active hafnium isotope can only be due to the process :

$$_{72}Hf^{180} + {}_0n^1 = {}_{72}Hf^{181}.$$

On emitting β-rays, according to the equation,

$$_{72}Hf^{181} = {}_{73}Ta^{181} + \beta,$$

the active hafnium isotope becomes the only stable isotope of tantalum known.

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March 15.

[1] cf. G. Hevesy, *Proc. Roy. Danish Acad.*, Feb. 3, 1935.
[2] Amaldi, D'Agostino, Fermi, Pontecorro, Rasetti and Segrè, *Ricerca Scientifica*, Dec. 2, 1934.

Extension of the Ultra-Violet Wave-Length Limit

THE best light source for the spectroscopy of the extreme ultra-violet region is the hot spark. In the spectroscopic work at this Institute, the electrodes of the spark are usually connected through short straight leads to four condensers having a capacity C of 0·4 μF. together. These are charged to a tension V = 50–70 kv. The discharge through the spark is periodic with a period T of about 8 μ sec. (corresponding to a wave-length of 2,400 metres). The maximum current in the spark is

$$i_{max.} = V\sqrt{\frac{C}{L}} = 2\pi\frac{CV}{T}.$$

If in our case, V = 50 kv., we have $i_{max.}$ = 16,000 amp. If we wish to increase the current in the spark we have to increase the tension V, which is possible only to a certain extent. Further, we can increase the capacity C, but this gives a rather slow increase in i. Finally, we can decrease the inductance in the circuit.

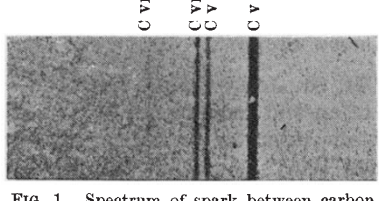

FIG. 1. Spectrum of spark between carbon electrodes. Time of exposure ½ hour. Focused at about 30 A.

Now the straight leads from the condensers to the spark do not give the minimum inductance. In fact, if we 'cable' the leads so that the current flows in the interior of a cable in one direction and returns