Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 192.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Action of Slow Neutrons on Rare Earth Elements

IN view of the discrepancy between the values obtained by different workers for the periods and the intensity of radiation emitted by the radio rare earth elements[1-5] after neutron bombardment, we carried out a detailed investigation on this subject and also on the absorption of slow neutrons in rare earth elements. The latter measurements were carried out chiefly to ascertain the possible presence of strongly capturing isotopes but leading to the formation of a stable instead of an active isotope, as was actually found to be the case for europium. Our investigations lead to the result that the discrepancies can in most cases be explained through the presence of small amounts of impurities showing a very strong activity, like dysprosium in the sample investigated, while some of the very high absorption data found by different workers are due to the presence of highly absorbing substances like gadolinium, samarium or dysprosium in the samples used.

Artificial Radioactivity of Rare Earth Elements

Element Bombarded	Half-life Value	Relative Intensity
Yttrium	70 h.	0·5
Lanthanum	1·9 d.[3]	—
Cerium	—	—
Praseodymium	19 h.[1] 5 m.[1]	4·5
Neodymium	1 h.[1]	0·04
Samarium	40 m.[1]; long[3]	0·6
Europium	9·2 h.[2]	80
Gadolinium	8 h.[5]	very low
Terbium	3·9 h.[2]	2·5
Dysprosium	2·5 h.[3,4]	100
Holmium	35 h.[4]	20
Erbium	12 h.[4]; 7 m.[3]	0·35
Ytterbium	3·5 h.[3,4]	0·25
Lutecium	6 d.[4]; 4 h.[3]	1·4; 1

Absorption of Slow Neutrons in Rare Earth Elements
(Amount necessary to reduce the activity of the indicator by ten per cent)

Element	Indicator	mgm./cm.^{2}
Europium	Europium	13
Dysprosium	Dysprosium	40
Holmium	Holmium	120
Europium	Rhodium	16
Dysprosium	,,	43
Holmium	,,	160
Gadolinium	Rhodium	2
Samarium	,,	12
Yttrium	,,	500
Scandium	,,	300
Cadmium	Rhodium	18

In the accompanying tables we give a list of the periods of decay of the radio rare earth elements secured by different workers and also absorption data obtained by us. A detailed account of our work will be published in the *Proceedings of the Royal Society*.

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[1] E. Amaldi, E. Fermi and others, *Proc. Roy. Soc.*, A, **149**, 522 (1935).
[2] S. Sugden, NATURE, **135**, 469 (1935).
[3] I. K. March and S. Sugden, NATURE, **136**, 102 (1935).
[4] G. Hevesy and H. Levi, NATURE, **136**, 103 (1935).
[5] Amaldi, Fermi l.c.; according to Sugden l.c. not active; while McLennan finds a period of 6·4 hours (NATURE, **136**, 831 (1935)).

Effect of Scattering Neutrons on Induced Radioactivity

M. DANYSZ, J. Rotblat, L. Wertenstein and M. Zyw[1] have found that iodine and silver exposed to neutrons acquire a stronger radioactivity if the neutrons are allowed to pass through lead or gold. We have investigated further this effect using different substances as scatterers, in the form of cylinders of 55 mm. height and 24·5 mm. diameter, with a coaxial cylindrical hole of 7 mm. diameter for the source of neutrons consisting of 35 millicuries of radon mixed with beryllium. Silver tubes of 25 mm. inside diameter were placed around the cylinders for activation. In this arrangement, practically all primary and scattered neutrons pass through the receiver. For comparison, source and receiver were placed in exactly the same positions but without any scatterer. With all substances we have found that the activity is increased, the effects ranging from a few per cent to about 18 per cent.

We have worked out our results in order to establish separately the increase produced in the amount of the two radioactive isotopes of silver by neutrons scattered in different elements. In the table below this increase is presented for each element as a percentage of the value obtained when no scatterer was used; in the second line of the table are products of the radial path of the neutrons in a given scatterer by its density.

The two isotopes behave in a different way. The product of 140 sec. half-period is enhanced in the case of all scatterers investigated with the exception of carbon and aluminium. If this effect is due to inelastic collisions of neutrons, as was assumed in the paper quoted above and also by Ehrenberg[2], then it should not occur when neutrons before passing through the scatterer are slowed down in the usual way by collisions with protons. The experiment must be restricted to elements which do not absorb slow neutrons. We have found, in fact, that the slow

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