

Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 153.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Artificial Radioactivity Produced by Neutrons

In the course of recent work in radium beam therapy research, we had the opportunity of making investigations in artificial radioactivity induced in some of the heavier elements through the agency of neutrons.

We had available a tube containing 500 mgm. of radium mixed with 2 gm. of finely divided beryllium. This source, and the element to be made radioactive, were immersed in a water bath to obtain the intensification of activity reported by Fermi and his co-workers, and interpreted by them as being due to neutrons slowed up by impact with the hydrogen nuclei of the water. The strong source used, and this method of obtaining intensification, permitted us to measure half-lives with fair accuracy in the case of elements previously reported weakly active. The following results were obtained :

Molybdenum	(1) 25 minutes
	(2) Roughly 36 hours
Palladium	(1) 14 hours
Tantalum	Very slight activity after exposure for 24 hours
Tungsten	(1) 23 hours
Platinum	(1) 36 minutes

The distribution of slow neutrons around the 500 mgm. source immersed in 60 litres of water was studied by measuring the activity excited in a silver tube. Between 5 cm. and 10 cm. from the source, the activity fell off as the inverse first power of the distance, while between 15 cm. and 30 cm. the activity fell off roughly as the inverse fourth power. The edge of the water bath was about 30 cm. from the neutron source. This may account for the rapid falling off observed at the greater distance. The slowed up neutrons could not be detected 2 seconds after the source was removed.

We also had available three small tubes each containing 100 mgm. of radium. In one there was 100 mgm. of beryllium ; in a second 100 mgm. of boron ; and in the third 100 mgm. of aluminium. In each case the metal was finely divided, and was intimately mixed with the radium associated with it. The radioactivity produced in iodine by each of the three tubes was compared, with the following results :

	Neutron source	Activity excited in iodine (relative)
Tube 1	Radium and beryllium	13.0
Tube 2	Radium and boron	4.5
Tube 3	Radium and aluminium	1.0

The activity produced in a silicon tube by the smaller radium and beryllium source was measured under similar conditions in air and in water. The water reduced the activity by a factor 0.6, in contrast to its effect with silver, when a great increase in activity occurred. The thickness of water between the neutron tube and the concentric silicon tube was 1.4 cm.

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A Spectroscopic Method for Detecting some Forms of Chelation

ABNORMALLY large differences in solubility and volatility between isomers of some disubstituted benzene derivatives have been explained by Dr. N. V. Sidgwick as arising from the presence of chelate rings in the anomalous compounds. These rings are considered to be formed between ortho substituents and usually to contain six atoms, one of which is hydrogen situated between two oxygen atoms. The ease with which such rings can be ruptured has prevented a demonstration of the phenomenon by the usual methods of organic chemistry. In the course of a quantitative study of the infra-red absorption coefficients of a series of organic molecules, which is in progress in this laboratory¹, an apparently specific behaviour has been found for this type of chelated compound.

Organic molecules containing OH, NH, SH or CH show, in the near infra-red, absorption which is characteristic of the presence of these groups. Two illustrative spectrographic records of absorption due to the presence of OH, NH and CH are contained (on p. 3575) in the first report¹ of the above mentioned research. In these studies, on which a second report is now being prepared for publication, it has been found that the absorption (area under the absorption coefficient against frequency curve) in the vicinity of 1.4-1.6 μ due to one NH or to one OH group, shows variations which are not very large even among molecules of widely different types. These variations are, however, by no means negligible. Actually the difference in area so far observed is such that the largest is less than three times the smallest. Since, however, in most cases an absorption of one fiftieth of the mean value could be detected with reasonable certainty, this characteristic absorption can probably be used with confidence in detecting the presence or absence of these groups in organic molecules. This forms the basis of the method here proposed for detecting some forms of chelation, the absence of such OH absorption in molecules showing OH by ordinary chemical tests being taken as indicating chelation through hydrogen. The variations in the area under the absorption curve constitute one of the quantitative differentiating factors which have been developed in the above mentioned research in an attempt to build an analytical method. Variations occur also within any one group such as OH or NH in the position of the absorption, as well as in the shape of the absorption curve, the latter being particularly striking. In those of the compounds discussed below which show OH absorption, pronounced variations in all three of these factors occur, and they may all be important in the matter of chelation, but their significance requires further study for its interpretation.

Particular examples of compounds that have been examined in the above manner and found to give no absorption characteristic of molecules containing