auriculatum^a has shown that it is not identical with solasonine.

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Mechanism of Hydrolysis of Inorganic Esters

By the use of water containing an excess over the normal of the heavy oxygen isotope (¹⁸O), it has been definitely and very directly shown that during the hydrolysis of the esters of weak carboxylic acids the break occurs at the C—O bond of the ester, thus:

Thus the alcohol resulting from the hydrolysis contains only the normal proportion of heavy oxygen isotope. This has been shown by Polanyi and Szabo¹ for the case of alkaline hydrolysis and by Datta, Day and Ingold² for the case of acid hydrolysis after Roberts and Urey³ had shown that the same C—O bond is involved in the reverse process of esterification.

We have recently carried out a similar experiment on the alkaline hydrolysis of trimethyl phosphato, using aqueous sodium hydroxide prepared by acting with sodium on water enriched in the heavy oxygen isotope. The hydrolysis was carried out at 80–90° C. and proceeded until slightly more than one methyl group was removed. The resulting aqueous methyl alcohol was distilled off and purified by fractionation. The alcohol vapour was then passed over a red-hot platinum filament, whereby it was 'cracked' to give carbon monoxide and hydrogen. The mixture, plus excess hydrogen, was passed over a nickel catalyst and the carbon monoxide thereby reduced to water. This water thus contained the oxygen for the alcohol produced in the hydrolysis. Its density was measured, after purification, by the usual micro-pycnometer method⁴.

The results are shown in the accompanying table, where $\Delta\rho$ (initial) is the excess density of the original water in parts per million and $\Delta\rho$ (final) is that of the water produced from the alcohol.

$\Delta\rho$ (initial)	$\Delta\rho$ (final)
180	0
180	+1
200	0

The results show quite clearly that during the hydrolysis the P—O bond of the ester is broken thus:

The experimental error of the density measurement may be taken as ± 5 parts per million, so that at

least 97 per cent of the hydrolysis must proceed as indicated above.

This is a somewhat surprising result in view of the fact that trimethyl phosphato is a fairly efficient methylating agent⁵.

Density measurements of the residual water show that, apart from the hydrolytic replacement of oxygen, there is only a very slight exchange of oxygen between the water and the ester.

During the hydrolysis carried out as described above, a considerable quantity of dimethyl ether is produced. We are endeavouring to determine whether or not this ether contains excess of ¹⁸O, and also to investigate the course of the hydrolysis in acid solution. We also hope to extend the work to other inorganic esters.

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Application of the Coincidence Method to Testing the Lifetime and Level Scheme of Radium C'

THE application of the coincidence method to investigations of nuclear processes may be extended in certain ways by using a variable resolving time of the coincidence circuit and by measuring pseudo-coincidences, that is, counts arising from two impulses which are not simultaneous but separated by a very short time. The number of 'coincidences' given by two particles, in which one follows the second in a time determined by the radioactive constant λ , is proportional to $1 - e^{-\lambda\tau}$, τ being the length of the impulse. The duration of the impulse is dependent upon the electrical constants of the circuit, and by changing the constants of one or both circuits it is possible to obtain various determined lengths of the impulses. In order to measure λ , two sets of experiments are made: (a) with the impulse τ_1 of the first particle long and of different durations, and the impulse τ_2 of the second very short; (b) with the conditions reversed. The difference $a-b$ is equal to $\frac{N_1 N_2}{N} (e^{-\lambda\tau_1} - e^{-\lambda\tau_2})$ where N_1 and N_2 are the number of counts in each counter, N the number of disintegrations. The method of lengthening the impulses only from one kind of particle allows one also to decide the order in which the particles are emitted.

In these experiments the method was applied to the transformation

Coincidences were observed between the various types of radiations, namely, α – β , α – γ , β – γ , and γ – γ . The β - and γ -radiations were measured in the usual way by means of Geiger-Müller tubes; the α -particles were counted separately by operating a Geiger-Müller tube in the proportional region. The curve on the accompanying graph gives the number of real 'coincidences' ($a-b$) from radium C β -particles and radium C' α -particles as a function of the length of the impulse from the β -particles. From this curve one obtains a value for the half-lifetime of radium C' of $1.40 \pm 0.15 \times 10^{-4}$ sec.*

The investigation of the α – γ coincidences gives a curve which is identical with the former, showing