Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 1102.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Isotopic Weights by the Doublet Method

CONTINUING work with my second-order focusing mass-spectrograph, the doublet 31 formed by P and CF has been measured by the use of a mixture of phosphine, carbon tetrafluoride and helium in the discharge. On some of the plates obtained well-matched doublets appeared at 28 due to Si and CO derived from the walls of the tube. This was very fortunate, for the intensities of these lines are virtually beyond any ordinary control. The value of the packing fraction of ^{28}Si deduced is only slightly different from that already given.

The first determination of the packing fraction of an isotope of sulphur has been made by means of the doublet ^{32}S and O_2 obtained by means of a mixture of sulphur dioxide, oxygen and helium.

Measurement of the chlorine isotopes was first attempted with heavy phosphine PD_3 mixed with a little CCl_4. This behaved very badly in the discharge tube, and a much better result was later obtained by the use of propane and methyl chloride which, when suitably mixed, gave three doublets 36 due to $H^{35}Cl$ and C_3, 37 due to ^{37}Cl and C_3H and 38 due to $H^{37}Cl$ and C_3H_2. The masses of the chlorine isotopes were calculated from the first two and the result for ^{37}Cl confirmed by measurements of the third. The following are the results:

Doublet	Number of doublets measured	Difference in packing fraction	Difference of mass
^{28}Si, CO	11	6·15±0·2	0·0172
^{31}P, CF	18	7·88±0·15	0·0244
^{32}S, O_2	18	5·53±0·1	0·0177
$H^{35}Cl$, C_3	8	6·25±0·2	0·0225
^{37}Cl, C_3H	22	11·14±0·2	0·0412

Symbol	Packing fraction	Isotopic weight
^{28}Si	−4·90	27·9863±0·0007
^{31}P	−5·30	30·9836±0·0006
^{32}S	−5·53	31·9823±0·0003
^{35}Cl	−5·71	34·9800±0·0008
^{37}Cl	−6·10	36·9775±0·0008

In calculating these, I have used the values of the doublets appearing in my two previous letters[1]; however, since these appeared, other workers' values have been published. K. T. Bainbridge and E. B. Jordan[2], using a double focusing mass-spectrograph of about the same dispersion and even greater resolving power than mine, give for the fundamental doublet O, CH_4 a difference of mass of 0·0369 ± 0·0002, whereas I obtained 0·03601 ± 0·00024. The discrepancy only amounts to 5 parts in 10^5 in the absolute mass, but it is well outside the probable error.

I have therefore repeated my measurements with special precautions. The electric deflecting plates were resurfaced, a new front slit was fitted and a different form of discharge tube used, but the mean value given by thirteen doublets was virtually the same as mine given above. No individual doublet in this group even reached the higher figure.

As a final check and to eliminate any possible difference between atomic and molecular lines, I decided to measure the doublet CO, C_2H_4, which will obviously measure the same difference of mass, though less accurately. To get matched pairs in this case has proved extremely difficult, but after long running with pure ethane, this has been done and measurements of ten doublets definitely support my value.

Bainbridge and Jordan do not state with what unit their dispersion coefficients were calibrated. I used the bromine lines to calibrate the instrument originally, and for these two particular doublets was able to check the figures to within a fraction of 1 per cent by the positions of the neighbouring lines CH_3, OH in one case, and C_2H_3, C_2H_5 in the other. The discrepancy therefore remains quite unexplained.

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[1] NATURE, **137**, 357 (February 29, 1936); **137**, 613 (April 11, 1936).
[2] *Phys. Rev.*, **49**, 883 (1936).

Selective Absorption of Neutrons in Silver

WE have measured the absorption in boron of the neutrons which excite γ-rays in silver. The arrangement used is shown in Fig. 1. The silver in the form of a hollow cylinder 4 mm. thick surrounding the counter was shielded from the effects of stray neutrons by layers of B_4C about 5 mm. thick. After being slowed down by the paraffin block and the thermal neutrons filtered out by a cadmium sheet 0·5 mm. thick, the neutrons passed through the B_4C absorber placed directly beneath the silver.

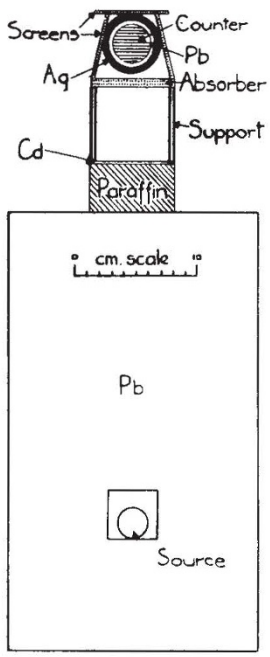

FIG. 1. Experimental arrangement.

Fig. 2 shows the curve obtained when the γ-ray activity induced in the silver is plotted against the amount of boron contained in the absorber. The figure shows also a second set of points obtained when the system consisting of the counter, silver, etc., was lowered 5 cm. The close similarity of the two curves shows that no appreciable correction for geometry is required.

The absorption curve of Fig. 2 may be analysed into two portions as is explained in the figure: