Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 158.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

Packing Fractions of Krypton and Xenon

THE lines produced in mass spectra by hydrocarbon molecules have always played a predominant part in the accurate measurements of mass. This is particularly so in the use of the doublet method, since their high masses, due to the hydrogen, tend to provide easily resolvable doublets with ordinary atomic lines. With methane and ethane there is no difficulty in producing all the lines of the C_1 and C_2 groups, but when propane is used in a cylindrical discharge tube, only the first four lines of the C_3 group, 36, 37, 38 and 39, have a workable intensity. These were used in the measurements of the isotopes of chlorine[1]. Fortunately, the lower pressure discharge in an eight-inch bulb gives all the lines up to C_3H_8, though the even ones, 40, 42, 44, are weaker than the others. This has enabled comparisons to be made with the multiply charged lines of krypton and xenon, giving direct measurements of their packing fractions much more accurate than the indirect ones made ten years ago[2]. The following are the results :

Doublet		Number of doublets measured	Difference in packing fraction	Difference of mass
$^{78}Kr^{++}$	$- C_3H_3$	4	$16{\cdot}28 \pm 0{\cdot}2$	0·0635
$^{82}Kr^{++}$	$- C_3H_5$	19	$20{\cdot}20 \pm 0{\cdot}15$	0·0828
$^{84}Kr^{++}$	$- C_3H_6$	20	$21{\cdot}73 \pm 0{\cdot}15$	0·0913
$^{86}Kr^{++}$	$- C_3H_7$	18	$23{\cdot}10 \pm 0{\cdot}15$	0·0993
$^{129}Xe^{+++}$	$- C_3H_7$	14	$20{\cdot}16 \pm 0{\cdot}1$	0·0867

Presence of traces of argon in the tube prevented any accurate determination of ^{80}Kr. Measurements of $^{132}Xe^{+++}$ by the doublet at 44 were unsatisfactory owing to the presence of CO_2, but its packing fraction appears to be nearly the same as that of ^{129}Xe, and is given provisionally.

The following are the packing fractions and isotopic weights deduced from values of hydrogen and carbon of 1·00812 and 12·00355 respectively :

Symbol	Packing fraction	Isotopic weight
^{78}Kr	− 7·30	$77{\cdot}9430 \pm 0{\cdot}0020$
^{82}Kr	− 7·70	$81{\cdot}9369 \pm 0{\cdot}0015$
^{84}Kr	− 7·60	$83{\cdot}9362 \pm 0{\cdot}0015$
^{86}Kr	− 7·40	$85{\cdot}9363 \pm 0{\cdot}0015$
^{129}Xe	− 4·46	$128{\cdot}9424 \pm 0{\cdot}0020$
^{132}Xe	(− 4·4)	(131·942)

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July 9.

[1] NATURE, **138**, 1094 (December 26, 1936).
[2] *Proc. Roy. Soc.*, A, **115**, 506 (1927).

The Two Crystalline Modifications of Insulin

PROF. E. B. MATHEWS' first examination of Abel's crystalline insulin showed the presence of two types of insulin crystals[1]. One of these, the so-called prismatic or needle variety, had marked birefringence and a development of faces strongly suggestive of rhombohedral symmetry, the crystals being elongated along the trigonal axis. Crystals of this type are commonly wedge-shaped, and very small wedge-shaped crystals have also been obtained by Scott[2] by crystallization of insulin from acetate buffers at *p*H 5·2. The more common variety of insulin crystals are those obtained first by Abel[3] from phosphate buffers at *p*H 6·2. These are very small flat rhombohedra appearing isotropic as usually viewed along the trigonal axis, but having actually positive birefringence. X-ray examination has here shown the presence of a simple rhombohedral unit cell[4]. It has been usual in the literature to describe these two forms—prismatic and rhombohedral—as polymorphic modifications[5].

Through the kindness of Prof. F. L. Pyman, I have now had the opportunity of examining also insulin crystals of the prismatic type by the X-ray method. Two preparations were available. One of these consisted of very small crystals roughly wedge-shaped in outline and frequently twinned in cross forms as described by Mathews. As these crystals were only 0·05 mm. long and less than 0·01 mm. across, they could not be used for X-ray measurements. But there seems no doubt that the second preparation is identical with this, though here the crystals showed no identifiable faces. They were roughly needle-shaped masses up to 0·3 mm. long and rather less than 0·1 mm. in cross-section, extinguishing uniformly between crossed nicols and showing, as do the small wedge-shaped crystals, positive birefringence.

These needle-shaped crystals gave on X-ray examination photographs identical in the spacings and intensities of the X-ray reflections with those obtained from the original 'rhombohedral' crystals. The crystal structure is therefore the same in the two forms, and these are not polymorphic modifications though the change in habit is certainly very striking. Even here there is evidence that forms intermediate between the two varieties may occur. One sample of insulin, recrystallized from sodium dihydrogen phosphate and acetic acid, consisted very largely of small crystals showing nearly equal development of rhombohedral and prismatic (or more probably steep trapezohedral) faces, which gave them at first sight the appearance of rhombic dodecahedra. These crystals were much too small for X-ray examination, but the possession of positive birefringence combined with the symmetry leaves little doubt of their identity with the other two varieties.