Atomic Weight of Fluorine

WE have recently pointed out [1] that there appears to be no evidence for the view expressed by Prof. Moles that methyl fluoride made by Collie's method consists of a constant boiling mixture with methane. It was, however, suggested by Prof. Moles that both Collie's critical data and also the compressibility at 0° C. (1·011) which we deduced from microbalance measurements are incorrect owing to the above cause. We have accordingly carried out a series of determinations of the critical constants of methyl fluoride prepared both by Collie's method and also by the methyl sulphate–potassium fluoride method used by Prof. Moles. We have also measured the compressibility coefficient of methyl fluoride made by the latter method.

The methyl fluoride prepared by Collie's method was that used in our preliminary determinations of the limiting density. The gas generated by the second method appeared to be mixed with rather more than its own volume of methyl ether. The material thus obtained was purified chemically and also by repeated fractionation, the final sample being bubbled through its own liquid. It must be emphasised that whereas it is comparatively easy to obtain pure methyl fluoride by Collie's method, we found it exceedingly difficult to purify the gas obtained by the methyl sulphate method.

The critical data of the two samples of the gas were determined in a modified Andrews compression apparatus. The critical temperatures and pressures were identical for the two samples, whilst the critical volumes agreed within the limit of error of our measurements. This agreement of the results appears to indicate that pure methyl fluoride can be obtained by either method. The critical constants also show no great divergence from those originally determined by Collie. A comparison of the data is given in the accompanying table.

Observer.	Critical Temp.	Critical Press.	Critical Vol.
Collie	44·9° C.	62 atmos.	—
Cawood and Patterson	44·55° C.	58·0 ± 0·2 atmos.	3·33 c.c. per gm.

The *pv-p* isothermals of methyl fluoride made by the methyl sulphate method were measured in the compression apparatus over pressures of 1 to 3 metres using tubes of 4·5 mm. bore. The relationship between *pv* and *p* was linear to a considerable degree of accuracy, and gave at 0° C. for the compressibility $(1+\lambda)$ over 1 atmosphere the value 1·0115. This result is in satisfactory agreement with the figure 1·011 which we calculated for the compressibility at 0° C. from our microbalance experiments at 21° C., and also with the calculations of van Laar when allowance is made for the changes in the critical data. This figure is, however, entirely different from the value 1·018 measured by Moles and Batuecas [2] and used by them in their determination of the limiting density of methyl fluoride. If the compressibility 1·0115 is applied to their normal density a value of 19·2 is obtained for the atomic weight of fluorine. There appears, therefore, to be little doubt that their determinations, both of the normal density as well as of the compressibility of methyl fluoride, are incorrect, though by a partial compensation of errors they lead to an atomic weight of fluorine in accordance with the mass spectrograph measurements.

We have also measured the compressibility of methyl fluoride at 21° C., and find the value 1·0087. This is in satisfactory agreement with our microbalance value of 1·0083, when it is considered that the latter determination was only made over a pressure range of about 170 mm. It will be noted that if we apply the correct value 1·0087 to our microbalance ratios previously given,[3] the atomic weight of fluorine still remains at the value 19·01.

The details of these investigations will be published elsewhere.

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[1] NATURE, **129**, 245, Feb. 13, 1932.
[2] *J. Chim. Phys.*, **18**, p. 353; 1920.
[3] NATURE, **128**, 375, Aug. 29, 1931.

Ovis astore, a Three-Coated Sheep

INTERESTING speculations have been made in these columns recently on the constitution of the coat of a sheep from Astor (Gilgit) which was first described by Prof. Barker.[1]

An examination of the cuticular scale structure of the component fibres of the fleece would afford real evidence as to whether or not such fibres would fall readily into three distinct groups. I therefore obtained, by courtesy of Prof. Barker, a sample of the fleece of the sheep from Astor, compared the appearance and lengths of the various fibres, and made a careful examination of the whole of their scale pattern. The scaling of the cuticle was seen by using a method which demonstrates faithfully the scale margins even of densely pigmented fibres.

During a general examination of the sample, I found, in addition to the three classes of fibres

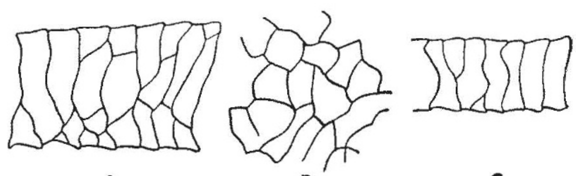

FIG. 1.

previously described, namely, long coarse white, short fine white, and short coarse pigmented, two other classes of fibres; these were (*a*) a long, coarse, and slightly pigmented fibre; (*b*) a long, curly white fibre intermediate in diameter between the long coarse white fibre and the short fine white wool fibre. It remained to compare the scaling of these five kinds of fibres, and the following results emerged:

I. *Heavily pigmented fibres of various lengths* (2·5-5·5 cm.). These fibres all showed an irregular segmental mosaic pattern (Fig. 1, *A*) almost as far as the tip end.

II. *Long* (6-7 cm.) *slightly pigmented fibres.* These fibres showed a generalised mosaic pattern (Fig. 1, *B*) which merged into the irregular segmental mosaic (*vide* Fig. 1, *A*) type of scaling, often in the upper portion of the fibre.

III. *Long* (8-9 cm.) *coarse white fibres.* This fibre exhibits the generalised mosaic pattern (*vide* Fig. 1, *B*) along most of its length, but the irregular segmental mosaic pattern is seen in some portions.

IV. *Long* (6-7 cm.) *curly white fibres*, intermediate in diameter between those of III. and V. (*vide infra*). The scaling was definitely of a mosaic, and mostly of an irregular segmental mosaic character.

V. *Short* (1-2 cm.) *fine curly white wool fibres.* The scales of these fibres were shallow and mostly coronal, that is, each scale generally completely encircled the fibre (Fig. 1, *C*).

The sample had been cut from the sheep and consequently the scaling of the extreme roots and tips