

obtained from a platinum-wire katharometer is weaker than that from a thermistor device, but can be applied to a spot galvanometer or a recording potentiometer of 1 mV. span, without pre-amplification. The columns and katharometer are immersed in an oil-bath which is maintained at $30 \pm 0.05^\circ \text{C}$. It has been claimed⁴ that if the current flowing through the bridge circuit is kept constant, the response obtained from the katharometer is independent of temperature. While this appears to be true for certain gases, of which hydrogen is one, in practice it has been found to be very difficult to maintain the current within the necessary limits, as a small error in setting the current produces a magnified error in the response. In order to obtain a high degree of reproducibility, the alternative procedure of maintaining the apparatus at a constant temperature has been adopted.

Oxygen-free nitrogen is normally used as the carrier and reference gas. In cases where a particularly high sensitivity is required, it has been found advantageous to use argon for this purpose on account of its lower thermal conductivity. The pressure drop across the columns is maintained at 14 cm. of mercury, this being equivalent to a flow-rate of about 50 ml./min. through each column. A 10-ml. sample is taken for each analysis, hydrogen being eluted from the separating column after 40 sec. For gases which are eluted from the column very rapidly, it is permissible to assume that the peak height is proportional to the amount of the component present, over a wide range of concentrations; thus the recorder can be calibrated directly in terms of hydrogen. Determinations can be carried out with an accuracy better than ± 0.005 per cent of hydrogen, and amounts down to 0.005 per cent can be detected.

This instrument was primarily designed for the determination of hydrogen, but methane can also be determined, being eluted from the separating column in 2 min. 30 sec. As would be expected from the lower thermal conductivity of methane, the sensitivity of the instrument to this gas is rather lower than in the case of hydrogen. For methane, the precision and sensitivity are rather less than that obtainable with the Haldane apparatus; but the extreme rapidity of gas chromatography makes the method useful when the saving of time is an important consideration.

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¹ Janak, J., *Chem. Listy*, **47** (6), 828 (1953).

² Janak, J., *Chem. Listy*, **47** (6), 837 (1953).

³ Ambrose, D., and Collerson, R. R., *J. Sci. Instr.*, **32**, 323 (1955).

⁴ Percival, W., *Analyt. Chem.*, **29** (1), 20 (1957).

Discovery of Radon

THE books on radioactivity and physics agree in attributing the discovery of radium emanation to E. or F. Dorn, giving as a reference either *Abh. Naturf. Ges. Halle* (1900) or (such as "Geiger and Scheel" and "Wien-Harms") the same publication, **22**, 155 (1900). Mellor adds, "E. Dorn, Ueber die von radioaktiven Substanzen ausgesandte Emanation, Stuttgart, 1900". The volume of the *Abhandlungen*

der Naturforschenden Gesellschaft zu Halle mentioned, namely, **22**, is dated 1900-1, and p. 155 is in the middle of a long article on the flora of Scandinavia.

There are three papers by E. Dorn in the volume, none of which contains any mention of radium emanation. Dorn's announcement of the discovery of this is contained in the *Abhandlungen* dated 1901, **23**, and is the first paper, of 15 pages, the communications being paginated separately. The *Abhandlungen* were published in Stuttgart and the title of the paper is (with "Über" instead of "Ueber") the same as that given by Mellor for what might be thought to be a separate publication. At the end of the paper is: "Zum grossten Teil vorgetragen in der Sitzung von 23 Juni, 1900", so that the discovery should be dated 1900.

Dorn used apparatus very like that used by Rutherford in his earlier discovery of thorium emanation, which Dorn mentions and confirmed. Dorn used radium bromide and found that the emanation did not penetrate aluminium, as Rutherford stated was the case with thorium emanation. The E. and F. Dorn mentioned by various authors are the same person, Friedrich Ernst Dorn, born in 1848, professor of physics in Halle.

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Lattice Constants and Magnesium Contents of some Naturally Occurring Whitlockites

CALCIUM phosphates occurring in Nature are in general of the apatite type, more or less crystalline. So far, in only one domain have calcium phosphates of the whitlockite type been found to be common—in the calcified deposits found on human teeth¹ and in the adjoining salivary ducts and glands². We have recently examined a large number of samples of dental calculus and some other natural and synthetic whitlockites³.

Lattice constants and rhombohedral unit cell volumes for various types of whitlockite are set out in Table 1. For comparison, the corresponding data are given for magnesian and ferroan whitlockites (containing respectively 9.5 atom per cent substitution of magnesium or ferrous iron for calcium), and for β -tricalcium phosphate. All these were prepared by sintering at $1,100^\circ \text{C}$. The pathological calcifications are practically iron-free; hence their low lattice constants and unit cell volumes must be due to substitution by magnesium. It does not seem feasible to distinguish by X-ray methods between magnesian and ferroan whitlockites.

Examination of a series of synthetic magnesian whitlockites has shown that the displacement of the lines in the powder diagram is roughly proportional to the magnesium content up to 9.5 atom magnesium per cent in the cation. The latter figure represents the solubility limit of magnesium in the whitlockite lattice and corresponds to the substitution of two of the calcium atoms in the unit cell $[\text{Ca}_{21}(\text{PO}_4)_{14}]$ by magnesium. The magnesium contents of the whitlockite samples given in the final column of the table have been calculated from the displacement of five (or six) characteristic lines. The magnesium contents of the mineral whitlockites have not been