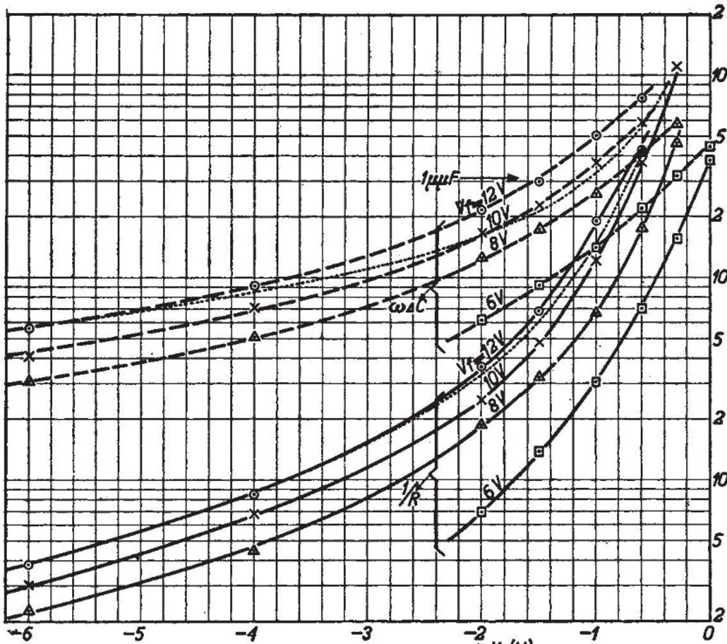

$1/R$ AND $\omega\Delta C$ AS A FUNCTION OF V_a FOR HEATER VOLTAGES V_f OF 12 V., 10 V., 8 V. AND 6 V. RESPECTIVELY

of about 10 cm.^{2} and an anode–cathode distance of 0·1 cm. The results are shown in the accompanying graph, in which the conductive part $1/R$ (full lines) and the reactive part $\omega\Delta C$ (broken lines) of the additional admittance due to the space-charge between anode and cathode is plotted against the anode voltage V_a (not corrected for contact potentials) with the heater voltage V_f as a parameter (heater voltage V_f = 12 V., 10 V., 8 V. and 6 V. respectively).

The graph also shows the dotted curves $C_1 V_a^{-1}$ (upper curve) and $C_2 V_a^{-2}$; the constant C_1 is chosen so that the first curve coincides with the curve $\omega\Delta C$ (for V_f = 12 V.) at $V_a = -6$ V., the constant C_2 so that the second curve coincides with the curve $1/R$ (for V_f = 12 V.) at $V_a = -6$ V. These curves indicate that $\omega\Delta C$ and $1/R$ are approximately proportional to V_a^{-1} and V_a^{-2}, respectively. $\omega\Delta C$ and $1/R$ are only slightly dependent upon the saturation current of the cathode. Taking the saturation current at V_f=6 V. as a unit, we measured at V_f=8 V., 10 V. and 12 V., saturation currents of 14, 140 and 1,100 units, respectively. This shows that a change in saturation current by a factor 100 only results in a change in $\omega\Delta C$ and $1/R$ by about a factor 3 or less. It would be expected from a theoretical point of view that the dependence of $\omega\Delta C$ and $1/R$ upon the saturation current will be more pronounced if either the cathode–anode distance or the saturation current is smaller (compare the curves for V_f = 6 V. and V_f = 8 V.).

It is also to be expected from a theoretical point of view that ΔC would scarcely depend on frequency, and that $1/R$ would be proportional to ω^2, except for the highest frequencies.

A full account of our investigations will be published elsewhere.

A. VAN DER ZIEL

Natuurkundig Laboratorium der
N. V. Philips' Gloeilampenfabrieken,
Eindhoven.
Feb. 13.

[1] Smyth, C. N., *Nature*, **157**, 841 (1946).

Determination of the 'Loading' in Paper by Microradiography

THE development of microradiography as a result of the researches of Goby, Dauvillier, Lamarque, Trillat, and of Maddigan, Ball, Clark, etc., is well known. The latter recommended the use of characteristic radiation for metallurgical applications. One may endeavour to generalize his ideas in other fields.

In this respect, we have been able to show that it is possible to obtain information regarding the 'loading' in paper by using a characteristic radiation (iron $K\alpha$, or copper $K\alpha$).

The 'Metalix' tube used is run at a tension of 25 kilovolts. The samples are placed in a circular camera at 2 cm. from the window. The emulsion is a Lippmann-Gevaert film placed in direct contact with the sheet to be examined. For an intensity of 15 milliamperes, the time of the exposures did not exceed five minutes. After development, the image was enlarged by a microscope with a photographic camera. Figs. 1 and 2 correspond to bisulphite papers with 'loadings' of different natures amounting to 10 per cent. The 'loading' appears in white, and the initial enlargement is of a range of 125 diameters. A comparison between the photographs shows the interest of the method.

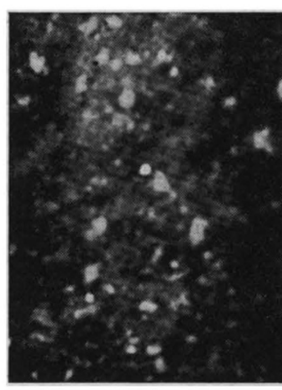

Fig. 1

Fig. 2

We have taken microradiographs of many samples of paper 'loaded' with different materials (titanium oxide, kaolin, etc.) at different concentrations. With characteristic radiation it is possible to control the loading in paper and even to determine approximately its proportion[1]. In order to obtain information regarding the actual fibres, it is necessary to use a greater wave-length (for example, chromium $K\alpha$) or a low-voltage tungsten tube.

The above investigation was carried out for the Fonds du Centenaire de l'A.I.Lg.

H. J. LAMBOT

Laboratoire d'Applications des Rayons X,
University of Liège.

[1] Lambot, H. J., *Bull. Soc. Sci. Liège* (1946).