anodic gradients recognisable on the curves. Qualitative experiments without filter-paper on specimens covered with a layer of liquid and without a scratchline indicate that here also corrosion is connected with electric currents, but the capillary disturbance of the liquid surface at the moment of tapping interferes with serious measurement.

The definite association of corrosion and immunity with well-separated anodic and cathodic areas, respectively, accords with the electrochemical mechanism of corrosion, as developed in previous papers with Bannister, Britton, Hoar, Borgmann, Mears and Lewis[1].

U. R. EVANS.

Metallurgical Laboratories,
University,
Cambridge.

[1] Proc. Roy. Soc., A, **131**, 355 ; 1931. **137**, 343 ; 1932. **146**, 153 ; 1934. Trans. Electrochem. Soc., **57**, 407 ; 1930. **61**, 441 ; 1932. **65**, 249 ; 1934. Trans. Faraday Soc., **30**, 417, 424 ; 1934. **31**, 527 ; 1935. Korrosion u. Metallschutz., **6**, 74, 173 ; 1930. **11**, 121 ; 1935.

Absorption of Short Wave-length X-Rays

WE have recently had the opportunity of measuring the absorption coefficients of a number of substances for short wave-length X-rays. The radiations were produced at 250 k.v. (constant potential) using a filter of 3 mm. lead, 2 mm. tin and 3 mm. aluminium.

Spectroscopic evidence shows a narrow band of X-rays with a mean wave-length of 59 X.U. The measurements were carried out using a carefully controlled parallel plate chamber equipment with a compensation method of measurement as in setting up such apparatus for standardisation in roentgens[1]. Care was taken to reduce the scattered radiation entering the chamber, and the error in absorption coefficient due to it is estimated at not greater than two per cent. The absorption coefficients of a number of elements are given below.

Element	Form	Mass absorption coefficient μ/ϱ	Electronic absorption coefficient $\times 10^{24}$
Lithium	Metallic blocks in petroleum	0·107	0·408
Beryllium	Powder	0·110	0·413
Carbon	Graphite blocks	0·123	0·407
Oxygen	Liquid	0·120	0·398
Magnesium	Metallic blocks	0·121	0·405
Aluminium	Metallic blocks	0·119	0·409
Sulphur	Powder	0·121	0·401
Calcium	Shavings	0·135	0·447
Iron	Sheet	0·138	0·490
Copper	Sheet	0·154	0·558
Selenium	Powder	0·168	0·645
Rhodium	Sheet	0·246	0·928
Palladium	Sheet	0·232	0·887
Tin	Sheet	0·310	1·213
Iodine	Crystals	0·325	1·282
Tantalum	Sheet	0·658	2·70
Platinum	Sheet	0·684	2·83
Lead	Sheet	0·847	3·53

The mean absorption per electron for light elements up to calcium is, for this wave-length, $4·06 \times 10^{-25}$, in fair agreement with the predictions of the Klein-Nishina formula[2] ($4·00 \times 10^{-25}$ for $\lambda = 59$ X.U.) This result is of some biophysical interest in view of the problems of the physical basis of the effects of such radiations on living materials[3]. The photo-electric absorption coefficient per electron μ_τ, defined by $\mu_\tau = \mu_e - 4·06 \times 10^{-25}$ is found by us to vary according to the law $\mu_\tau = kZ^{3·0}$, where k is constant and Z the atomic number of the element[4].

We have also measured, for the same wave-length, the absorption coefficients of two liquids containing hydrogen, namely, water and ethyl alcohol, as well as deuterium oxide. The values are given below.

Substance	μ/ϱ	Form
Water	0·133	Distilled
Ethyl alcohol	0·142	A.R.
Deuterium oxide	0·118	99 per cent purity (Norwegian origin)

For short wave-lengths, the mass absorption coefficient for hydrogen should be approximately twice that of any other light element owing to the low ratio of atomic weight to atomic number. This appears in the results as an increase of 11 per cent in the mass absorption coefficient of water and 18 per cent for alcohol. Deuterium, on the other hand, would be expected to behave as a normal light element and this is verified in the value of μ/ϱ obtained for deuterium oxide.

It may be observed that absorption measurements of this type serve to count electrons per atom, as distinct from the more usual method of weighing isotopic nuclei.

W. V. MAYNEORD.
J. E. ROBERTS.

Radiological Department,
The Cancer Hospital (Free),
London, S.W.3.

[1] Mayneord and Roberts, British Journal of Radiology, **7**, 158 ; March 1934.
[2] Lauritsen and Read, Phys. Rev., **45**, 433 ; April 1934.
[3] Mayneord, Proc. Roy. Soc., A, **146**, 867 ; Oct. 1934.
[4] Rutherford, Chadwick and Ellis, "Radiations from Radioactive Substances", p. 479.

New Technique for Obtaining X-Ray Powder Patterns

To obtain the X-ray diffraction pattern of a flat specimen such as is met with in metallurgical practice, the specimen may be mounted in a circular camera and inclined at a small angle to the beam. This is illustrated in Fig. 1. With the usual diaphragm, we have observed that diffraction lines making a small
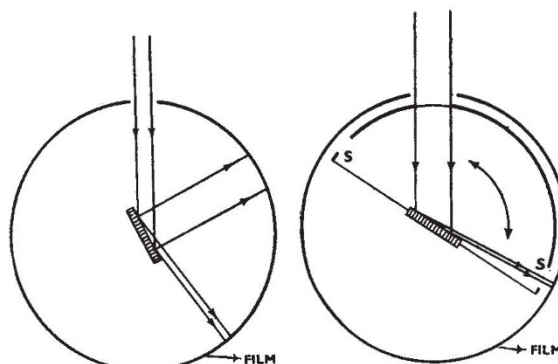

FIG. 1.   FIG. 2.

angle with the surface of the specimen are particularly sharp, but become broader as the angle between the diffracted beams and the surface of the specimen increases.

For a measurement one requires all the lines to be sharp, and so a camera according to Fig. 2 was devised, which can be used to record all or, if desired,