from the strongest plane(s). The two strong planes (002), (101) of cellulose II are not resolved at $2\theta \simeq 6°$ in the X-ray cameras generally employed for fibre work (excepting low-angle cameras), so that in all cases the extra reflexion appears single.

(4) With the tube conditions which produce a reflexion from cellulose at $2\theta \simeq 6°$, a reflexion is obtained from other substances, for example, from graphite at $2\theta \simeq 8°$, again corresponding to a wave-length of $\sim 0{\cdot}47$ A.

It can only be concluded that the reflexion at $2\theta \simeq 6°$ provides no justification whatsoever for revision of the unit cells of any or all cellulose structures.

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THE occurrence of an equatorial reflexion of spacing about 15 A. in the X-ray photograph of jute has been observed consistently in this Laboratory over a period of more than six years. The following observations indicate that this reflexion is not spurious in the sense claimed by Warwicker and Wellard.

(1) It appears on photographs taken with radiation monochromatized by reflexion in calcite, using a line slit.

(2) It appears in photographs taken with nickel-filtered copper radiation from an X-ray tube run at 22 kVp., which is below the excitation voltage of 0·47 A. radiation.

(3) In photographs taken with filtered radiation (30 kVp.) and with a sheet of aluminium 0·3 mm. thick interposed between two photographic films, it appears on the first film but not on the second, on which the white radiation alone is recorded (transmission at 0·5 A. about 86 per cent for 0·3 mm. aluminium).

(4) We have observed the reflexion using an experimental Geiger–Müller spectrometer (filtered radiation).

(5) We have observed consistently that the intensity of the reflexion in jute depends on the humidity in the way described by Sen and Roy. The changes of intensity are, by visual estimation, much greater than can be ascribed to the effect reported by Legrand, who found (002) to be rather stronger for wet than for dry specimens.

(6) In our experience (and here we differ from Sen and Roy), the reflexion does not occur in ramie photographs taken under the same conditions as the jute photographs referred to above, although the (002) reflexion in ramie is at least as intense as, and is certainly sharper than, that of jute. We have evidence, at present inconclusive, that degradation of ramie fibres may, in certain circumstances, lead to the appearance of this reflexion or one of similar spacing.

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Conductivity induced in Polytetrafluoroethylene by X-rays

IN the course of further measurements of conductivity induced in insulating materials by X-rays[1,2], we have investigated polytetrafluoroethylene, and find a relatively large induced current with a very long time constant. A small cylindrical condenser 2·5 cm. long with polytetrafluoroethylene as the dielectric medium was used in a vacuum chamber for the measurements during irradiation. The current (down to 10^{-13} amp.) was measured with a Baldwin 'Ionex' Mk3 d.c. amplifier. The X-rays were generated at 220 kVp., with a half-value layer of 1·7 mm. of copper.

Dose-rate dependence. The equilibrium induced current i is related to the dose-rate R by the general relationship :

$$i \propto R^{\Delta},$$

where Δ is a characteristic of the material. For polytetrafluoroethylene over the range $R = 2$ to 65 r./min., and between 20° and 110° C., we find $\Delta = 0{\cdot}63 \pm 0{\cdot}08$, with the higher values at the lower temperatures. This is in contrast to 'Perspex'[2] and some specimens of amber, for which $\Delta = 1{\cdot}0$, but compares with polythene[2,3], for which $\Delta = 0{\cdot}8$.

Such a value of Δ leads us to postulate an exponential distribution of traps below the conduction band for polytetrafluoroethylene, using Rose's model of electron trapping[4]. Quantitative predictions can also be made of the temperature-dependence of induced current.

Temperature dependence. Fig. 1 shows the curves of log conductivity of polytetrafluoroethylene plotted against $1/T$°K. The relationship is of the usual form[1] :

$$\sigma = \sigma_0 \exp(-W/kT),$$

giving a straight line the slope of which is a measure of W.

Curve a in Fig. 1 is for the 'static conductivity' (that is, with no incident radiation ; the specimen had, however, received a total dose of 10^4–10^5 r. some months previous to these experiments). This slope gives $W = 1{\cdot}1$ eV.

Curve b is for the equilibrium induced conductivity under X-irradiation, at $R = 7$ r./min. The slope in this case corresponds to $W = 0{\cdot}5$ eV.

From this slope, it can be seen that the induced current increases by a factor of 50 between 300° and 400° K. The corresponding increase predicted using Rose's model of an exponential distribution of traps, with $\Delta = 0{\cdot}63$, is by a factor of 30. The agreement is fair, and would be improved by taking a slightly higher value for the number of available energy-states in the lowest levels of the conduction band.

A further demonstration of the applicability of this model is provided by the variation of Δ with temperature. If $\Delta = 0{\cdot}63$ at 65° C., then calculation predicts $\Delta = 0{\cdot}60$ at 110° C. and $\Delta = 0{\cdot}66$ at 20° C. A systematic variation of Δ was in fact observed, with $\Delta = 0{\cdot}55$ at 110° C. and $\Delta = 0{\cdot}71$ at 20° C. The measured variation is somewhat greater than the predicted variation ; but this is probably because the experimental accuracy is rather low with such a small specimen.

Decay of induced current. The time-constant of decay varies slowly with temperature, showing the