LETTERS TO THE EDITORS

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Effect of Exposure to Gamma-Rays on the Hygroscopicity of Sitka Spruce Wood

THE possibility of controlling insect attack in wood by exposure to gamma-radiation has recently been discussed by Bletchly and Fisher[1]. Although the practical applications of this method have still to be worked out and evaluated, any *in situ* treatment will inevitably expose the wood to the effect of the radiation, and with the development in Britain of the atomic energy programme, the exposure of wood to ionizing radiations is likely to become more common.

It is therefore of interest to see whether these radiations influence the properties of the wood itself, and as a first step towards this end the effect of exposure to gamma-radiation on the hygroscopicity of sitka spruce wood has been determined. Since nearly all physical properties of wood are affected by moisture content, it is probable that the changes in hygroscopicity may give some indication of the changes to be expected in other physical properties.

With the co-operation of the Technological Irradiation Group of the Isotope Division, Harwell, disks of sitka spruce approximately 19 mm. in diameter and 1 mm. in thickness along the grain were irradiated with cobalt-60 gamma-rays (energy 1·17 and 1·33 MeV.) to dosage-levels of 10^6, 10^7 and 10^8 rad. The temperature of the source was 35–40° C. and the time of exposure 200 hr. for the 10^8 rad dose (and *pro rata* for lower doses). The exposures were continuous, and since there was only limited ventilation the samples were in an atmosphere containing appreciable though unknown amounts of ozone. There was no change in the appearance of the samples after irradiation, but at the highest dose, the wood seemed to have become slightly brittle.

The equilibrium moisture content/relative humidity curves were determined on control and irradiated samples by a technique involving the use of McBain quartz spring balances. The adsorption curves for zero and 10^8-rad exposure are shown in Fig. 1, and it is apparent that there is a small reduction in equilibrium moisture content at all relative humidities with the 10^8-rad dose. The curves for 10^6 and 10^7-rad exposure are not shown, but there is some evidence of a slight though scarcely significant reduction at 10^7 rad; the curves for the control and 10^6-rad specimens are indistinguishable. Desorption curves were also determined and showed similar effects.

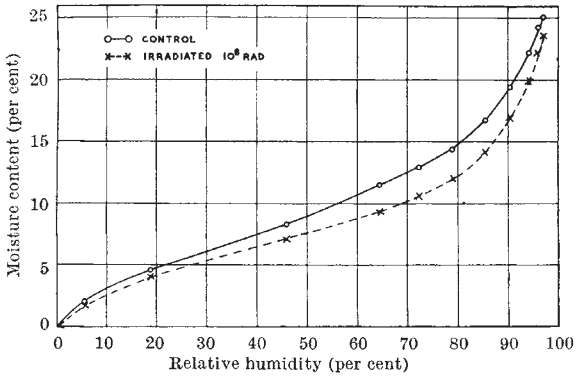

Fig. 1. Equilibrium moisture content/relative humidity curves in adsorption cycle for control and irradiated sitka spruce

It thus appears that the hygroscopicity (and possibly other physical properties) of wood are only affected by very heavy doses of radiation, and that at less than about 10^7 rad, the effect is negligible. This conclusion is in general agreement with the results of Lawton *et al.*[2], who studied the chemical changes in basswood on exposure to high-velocity electrons. They found that comparable exposures, approaching 10^7 r., were required before any chemical change became appreciable.

The doses of gamma-radiation mentioned by Bletchly and Fisher did not exceed about 60,000 rad and were often considerably less, whereas the present experiments involved doses greater by a factor of several hundreds. Thus any doses used for controlling wood-boring insects in practice are unlikely to have any significant physical effect on the wood itself.

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[1] Bletchly, J. D., and Fisher, R. C., *Nature*, **179**, 670 (1957).
[2] Lawton, E. J., Bellamy, W. D., Hungate, R. E., Bryant, M. P., and Hall, E., *Tappi* (Tech. Assoc. Pulp and Paper Industry **34**, 113A (Dec. 1951); *Science*, **113**, 380 (1951).

Absence of Lethal Radiation Effects following Massive Oral Administration of Plutonium

THE International Commission on Radiological Protection in its recommendations[1] assumed that radiation damage to the gastrointestinal tract from unabsorbed radioisotopes will be the critical factor in determining the maximum permissible concentration for many of these isotopes. Among the isotopes for which the gastrointestinal tract is considered the critical organ are a number of alpha-emitters. Since it seemed quite conceivable that the radiosensitive cells of the gastrointestinal tract might lie beyond the range of alpha-particles originating within the contents of the tract, experiments were initiated to determine the effect on the tract of an orally administered alpha-emitter.

For these studies plutonium-239 was administered to seventy-five rats, by stomach tube, as a hydrated polymer suspended in a nitrate solution at *p*H 2. Results obtained from preliminary acute toxicity studies within the lethal range are shown in Table 1. From these results it can be seen that death did not

Table 1. ACUTE TOXICITY TO RATS OF PLUTONIUM-239 ADMINISTERED INTRAGASTRICALLY

Dose (mc./kgm.)	Mortality (deaths/No. injected)	Time of death (days post-administration)
56	0/6	(none after six months)
88	1/4	1
93	2/4	1
100	2/2	1