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20. X-Ray Studies on partially Acetylated Polyvinyl Alcohol

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As previously reported (this Bulletin **24**, 92), partially acetylated polyvinyl alcohol was obtained by two different methods of preparation, i.e. acetylation of polyvinyl alcohol (PVA) and saponification of polyvinyl acetate (PVAc). Films were prepared from the two series of samples and X-ray investigations were carried out on these films.

So long as the degree of acetylation is the same, there was no difference between the two series of samples. At the beginning af the acetylation a slight increase of the spacing of A_1 (an inner weaker interference of PVA, d=7.73 Å) was obsesved. A_1 of PVA faded out at the degree of acetylation of about 10 mol%, while an interference which corresponded nearly to R_1 interference of PVAc appeared at the degree of acetylation of about 45 Mol%. The spacing of this interference gradually increased from 6.2 Å and finally attained the charcteristic value of PVAc (d=6.70–7.00 Å).

The spacing of A_4 of PVA (the outer stronger interference of PVA) however, after passing through a maximum at about 10 mol% (d=4.65 Å), gradually decreased and finally attained the characteristic value of R_2 of PVAc (d=3.94–4.00 Å).

Films from partially acetylated PVA were drawn at an elevated temperature and subjected to X-ray investigations. The results were essentially the same as by non drawn films.

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21. Electron Microscopic Investigation of Wood Tissue

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This paper is intended to enrich with further information the present stock of knowledge of electron microscopic structure of the plant cell wall by using the collodium one-step replica method, which proved to be suitable for examinations of soft tissues such as coniferous tracheids. The metal shadowed replicas could reveal the fine details as fine as 10 mμ.

Results: Observations of the replicas taken from the cross sections of wood clearly distinguished the lignin layer from the cellulose layers. The trace of knife-marks brought about at sectioning was hardly found in the lignin layer,

This will indicate that lignin must be viscoelastic by its nature. While the primary, secondary and tertiary walls were not differentiated, minute capillar openings were seen in the secondary cell wall. The smallest diameter of the openings were estimated at nearly 10 mμ. This agrees with the result of the previous observations made with thin sections. (K. Kobayashi and T. Kondo, Collected Papers of Nihon Kagaku-seni Kenkyusho, 8, 1, 1943).

Observations of the radial sections displayed the thin layer of primary wall which consists of striations arranged almost perpendicular to the fiber axis, in agreement with the conclusions inferred from optical microscopic examinations. The laminated structure of secondary wall was exhibited in detail by the layer-by-layer slicing of the wall. The fibrils in each layer are bound together somewhat tightly. But the cohesion between layers are so loose that they could easily be stripped off from each other. The inclination of fibrilles in each layer varies stepwise, but does not reverse in direction, as were suggested by many investigators. (K. Freudenberg; Tannin, Cellulose, Lignin, Julius Springer, Berlin, 1933). The fibriles in the innermost layer of secondary wall have a very large angle against fiber axis. The tertiary wall which is the inner surface of the tracheid, has a granular construction instead of a fibrillar structure. In the cell wall of ray cells the fibrils run in parallel to the cell axis and accordingly perpendicularly to the tracheid axis.

Observations were extended also to the surface of the wood fibers of unbleached and bleached rayon pulp (almost free from lignin), and some interesting facts were revealed with regard to the structure of bordered pits. The primary wall around the pit opening forms a disc with a circular arrangement of fibrils. On the other hand, the fibrils of the secondary wall run in a stream-line shape along the pit aperture. Furthermore, the existence of a thin membrane other than a valve was recognized, which intercepts the pit opening. Reference has not yet been made to this in the field of plant anatomy.

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22. The Relation between the Mechanical Properties of Polymethylmethacrylate Films and their Degree of Polymerization and Molecular Orientation

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(Sakurada Laboratory)

Mechanical properties of streched films of fractionated polymethyl methacrylate (degree of polymerization P=240–16000) were measured. Tensile strength increased