X-RAY DIFFRACTION STUDIES OF INORGANIC SALTS ADSORBED BY COTTON FIBRES

DETAILED studies have been reported in the past[1–5] on the fine structure of deposits of noble metals on cellulose as revealed by X-ray diffraction and optical methods. Similar studies on the fine structure of adsorbed dyestuffs on textiles have been done mostly by optical methods on account of the low X-ray scattering power of adsorbed organic dyes in the usual concentration range. However, there is some X-ray work in this connection.[6,7] In this laboratory, X-ray studies have, therefore, been instituted in order to investigate the fine structure of some simple inorganic compounds when adsorbed on cotton fibres. The compounds were chosen on the basis of their high scattering power for X-rays, low solubility in water and relatively high affinity for cotton. Typical

examples are the sulphides of lead and mercury and the chromates of lead and barium. These and similar salts were precipitated inside the fibre by impregnating the scoured fibre with an aqueous solution of a suitable salt of the metal and then transferring the fibres to the appropriate reagent. The treated cotton was soaped and boiled, or combed repeatedly, in order to remove surface deposits.

The X-ray diffraction pictures of the treated fibres showed powder patterns of known lattices of the salts (Fig. 1). The diffraction rings were somewhat diffuse, indicating that the linear dimensions of the crystallites were of the order of a micron or less. At present, the size and shape of the crystallites are being assessed from the measured line breadths.

In the case of a few salts, such as lead iodide and lead chromate, the powder patterns indicated that there was preferred orientation of a crystal axis parallel to the fibre axis. This result is in contrast to the random orientation which has been reported for metal deposits. Ramachandran and Ambady in a recent paper[8] report the production of highly oriented deposits of inorganic salts on collagen. The nature of the preferred orientation of adsorbed materials on cotton and the conditions under which the effect is best obtained are now under study.

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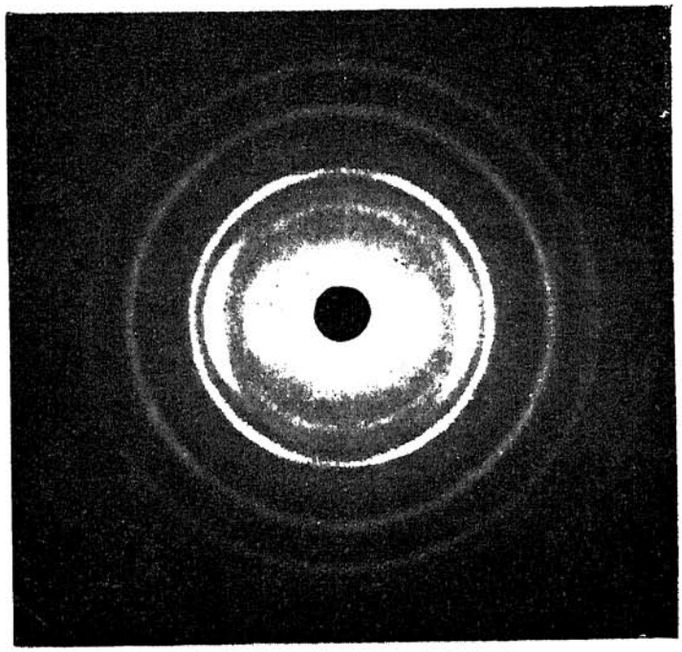
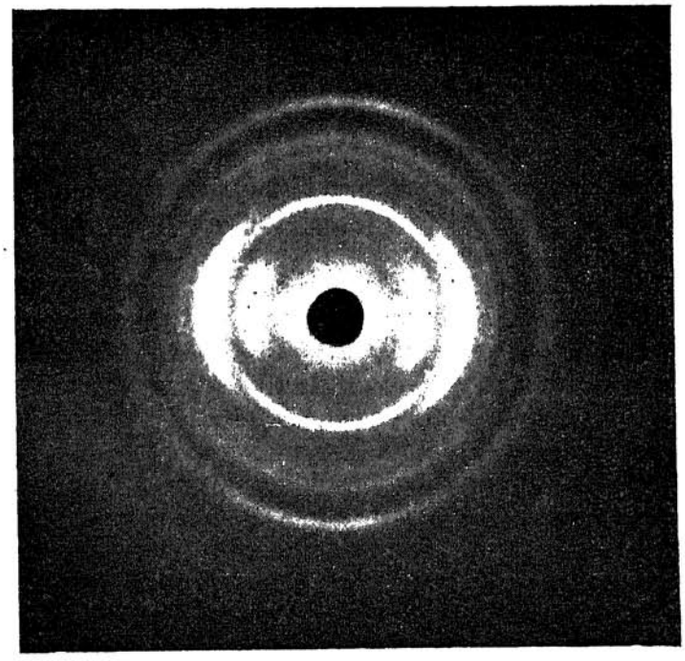


Lead Iodide



Lead Chromate

FIG. 1. X-ray Diffraction Patterns of Cotton Fibres Containing Adsorbed Inorganic Salts.

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