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Reclamation of and Dyeing Trials with Lac Dye from Lac Effluents

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Recovery of lac dye from lac effluents and dyeing trials with the lac dye on woollen and silk articles have been investigated. Lac dye of 70-75 per cent purity has been obtained and it has given level dyeing with mordants.

WASTE effluents from lac factories, resulting from washing sticklac with water, contain lac dye and a portion of wax and lac. Earlier studies on its hygienic disposal showed that addition of sulphuric acid precipitates most of the solid matter in the effluent[1]. The sludge contains 10-15 per cent of lac dye, 8-10 per cent of wax and 10-12 per cent of lac resin. Usually it has been estimated that from a washing of one quintal of sticklac nearly 7 kg. of dry sludge may be obtained. Thus, from about 40,000 tonnes of sticklac processed annually for seedlac, 2800 tonnes of dry sludge can be obtained. The amounts of dye, wax and lac recoverable from the sludge are 280, 224 and 280 tonnes respectively. In view of the high dye content, an economic process for its effective recovery has been developed. The dye obtained by this process has been tried for dyeing silk and wool.

The sludge, as precipitated with sulphuric acid from the wash liquor in processing the sticklac, after drying is obtained in the form of hard cakes which requires to be crushed to 30-40 mesh. It contains impurities such as insect bodies, sand, woody matter, in addition to dye, wax and lac resin. Exploratory experiments carried out to increase the dye recovery indicated that it might be helpful to remove at least a portion of the wax prior to extraction of the dye. Also borax solution was found to be the best

among the various dilute alkalis tried for extracting the dye from the residue after dewaxing.

Hence, experiments were carried out to remove resin and wax with hot industrial spirit, extract the residue with borax solution and finally precipitate it with sulphuric acid. It was found to increase the dye content to 65-70 per cent in the ultimate product but the loss of dye in the spirit was considerable. On the other hand, partial dewaxing of the sludge with white spirit or commercial hexane was more promising in that it gave a product containing 65-70 per cent dye with a better yield. But in the absence of any solvent extraction plant for removal of wax, partial dewaxing would not at all be economical. Consequently, other methods for better recovery of the dye without recourse to dewaxing were tried and a process based on direct extraction of the dye using borax solution has been developed.

Process

Powdered sludge (1 kg.) is thoroughly mixed with the requisite amount of powdered borax (100-120 g.), and a little of water (200-230 ml.) and left overnight. Thereafter, sufficient water is added to make it a one per cent borax solution, and stirred for an hour. Then 5 ml. of glacial acetic acid is added with stirring and the coagulated albuminous matter and other suspended impurities are allowed to settle. After about 2 hr the clear supernatant liquid is decanted, filtered through a thick cloth and acidified with 50 per cent sulphuric acid till the dye extract is just acidic to congo red paper. The lac dye which gets precipitated is allowed to settle for 2 hr. The clear supernatant (slightly coloured) liquid is decanted, the bottom sludge filtered through cloth and sun-dried or dried in a steam-heated stainless steel vessel. The dry mass is powdered to 80-100 mesh, in which form it is ready for use and contains 70-75 per cent dye.

Dyeing trials

Trials of the dye as a mordant dye for dyeing wool and silk gave satisfactory results. The trials have shown that the following method can be adopted for dyeing wool and silk.

A 1 per cent solution of the dye is prepared with boiling water containing 1 part of borax for 100 parts of water and the solution filtered through cloth. The wool or silk to be dyed is scoured. To a solution of 15 parts (on the weight of the material) of common salt in 50-60 parts of iron-free water contained in a stainless steel, or enamelled iron vat, the required amount of dye solution is added at room temperature. The dye bath is then made just acidic with acetic or sulphuric acid and the article is dipped in the bath and stirred continuously. The bath is then gradually heated to boiling in 15 min. and maintained at that temperature for an hour. When the amount of dye is more than 2 per cent on the weight of the material, it is advisable to add the dye solution in two or three lots for level dyeing. The percentage of dye (on the weight of material) recommended for obtaining different shades on wool and silk are as follows: light, up to 0·5; medium, 0·5-2·0; and heavy, 2·0-6·0 per cent.

After dyeing is complete, one of the following mordants or a mixture may be added in solution to the dyebath to give the shades given in parentheses (the presence of a little left-over lac dye in the bath does not hamper mordanting).

Tin chloride + oxalic acid (pink to Begonia rose); potash alum (purple); tin chloride + oxalic acid + potash alum (vinaceous purple); ferrous sulphate (mouse grey to sooty black); potassium dichromate + sulphuric acid (brown); and potassium dichromate + cream of tartar (violet).

For getting other shades, various other mordants may be used. The amount of mordant to be used varies from 2 to 5 per cent on the weight of the material depending upon the amount of the dye used and the shade required. After addition of the mordanting solution, the bath is maintained at boiling temperature for another hour. Then the dyed material is repeatedly washed with water till free from extraneous matters and dried.

Woollen and silk articles have been dyed by the above procedure to give very bright shades. The light and wash fastness have been tested and found to be very satisfactory. This dye has also been found to have good affinity for nylon fabrics. Brilliant pink colour on anodized aluminium can also be obtained by the use of the dye.

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Reference

1. Bhowmik, T. & Ghosh, A. K., *Res. & Ind.*, **3** (1958), 320.