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New Method for the Determination of Bleach Index of Lac

R. PRASAD & B. B. KHANNA
Indian Lac Research Institute, Namkum, Ranchi

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A simple and accurate method for determining the bleach index of lac is described. Unlike the conventional method, it does not require any bleach liquor. The basis of the determination of bleach index is its correlation with the colour of lac solution in alkaline medium. One determination can be completed within 3 hr as against 20 hr needed in the conventional method.

COLOUR of lac is an important parameter for its use in industry. Crude lac in its natural form contains two types of colouring matter: (i) a water-soluble dye consisting of laccaic acid and related compounds and (ii) a water-insoluble dye consisting of erythrolaccin and related compounds. The former is more or less completely removed during the processing of sticklac into seedlac. The colour of seedlac or shellac is thus mainly due to erythrolaccin. The removal of erythrolaccin can be effected either by the physical method of adsorption or chemically by converting it into a colourless compound through oxidation or reduction. The method most widely used in industry for making colourless lac involves bleaching of natural lac with sodium hypochlorite. The resultant product is popularly known as bleached or white lac.

The bleaching characteristic of lac is expressed in terms of bleach index or bleachability. The millilitres of sodium hypochlorite (3% available chlorine) required to bleach 30 g lac to the desired end colour under definite conditions is called the bleach index. Bleachability is estimated by adding specific volumes of standard sodium hypochlorite to alkaline lac solution and comparing the end colour with that of a standard sample of seedlac bleached under identical conditions. A number of methods are available[1] for the determination of bleach index or bleachability, viz. the United States Shellac Importers' Association (USSIA) method, Angelo Bros method and Sen's method.

Sankaranarayanan and Bose[2] developed a method for the determination of bleach index of lac, which is uniformly applicable to all grades of lac, does not require any standard seedlac and avoids repeated additions of small quantities of bleach liquor from time to time and filtrations and testing. The method is a significant improvement over the conventional methods and has been accepted by the Indian Standards Institution as the only method for the determination of the bleach index of lac after some modification. In this method, lac samples are extracted with soda and treated with a definite volume of bleach. The degree of bleaching effected is determined visually by matching the colour of the bleached solution (filtered free from wax) with that of 0·001*N* iodine solution in Dubosque colorimeter. Khanna and Sankaranarayanan[3] later made use of a photoelectric colorimeter in place of Dubosque colorimeter, thereby eliminating (i) the personal element in colour adjustments, (ii) the possibility of eye fatigue which usually results when a number of determinations have to be carried out in a visual colorimeter, and (iii) the need to prepare standard iodine solution from time to time once the colorimeter is suitably calibrated.

In all these methods, the bleaching of the seedlac extract has to be allowed to proceed overnight before the colour of the filtered bleached solution can be determined. The results of the determination are thus available only after about 20 hr. Shortening of this period would obviously be of great advantage

to industry and trade. The rate of bleaching of lac is accelerated by rise in temperature[4]. One possible way of speeding up the determination would, therefore, be to conduct the bleaching at higher temperature. Making use of this approach, Khanna and Sankaranarayan[5] succeeded in evolving a method for the determination of bleach index of lac by carrying out bleaching at a higher temperature (37·5 ±1°C). The other approach could be to measure the colour of lac solution and correlate it with the bleach index. There is apparently no definite relation between the depth of colour and its bleach index, as the two are determined in different media, the former in alcohol and the latter in aqueous alkaline medium and impurities such as insect bodies insoluble in alcohol get solubilized in alkaline medium. An attempt was, therefore, made to correlate the colour of lac solution in alkaline medium with the bleach index found by the conventional method.

Experimental procedure

Seedlac (10 g, passing through 10 mesh) was extracted with sodium carbonate (1 g) using distilled water (50 ml) in a 400 ml tall beaker. The beaker was heated by immersing it in a boiling water bath for 30 min, keeping the contents stirred with a glass rod. The extract was then filtered through 80 mesh sieve and the residue and the material sticking to the beaker washed with hot distilled water so as to keep the volume of the filtrate below 100 ml. The extract was then cooled to room temperature and the volume made up to 100 ml with cold distilled water so as to give 10% solution of lac. After cooling, the extract was filtered through a filter paper to remove the wax and the filtrate collected after rejecting the first few ml which are likely to be cloudy. The filtrate (10 ml) was thereafter taken and different dilutions made out of it with distilled water. The deflections of the resultant solutions were then measured with the help of Klett-Summerson photoelectric colorimeter (Model 900·3 using glass cell of effective depth 10 mm and green filter KS-54, approximate spectral range 500-570 m). It was found on examination of a number of lac samples that 1% solution of lac served the purpose best, as deflection obtained by it

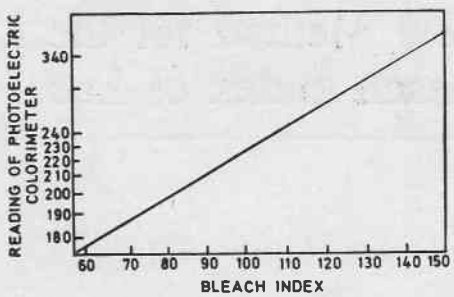

Fig. 1 — Deflection vs bleach index

caused a reasonable span on the scale of the photoelectric colorimeter. The bleach index of the same sample of seedlac was also determined using the conventional method.

Ten samples of seedlac were thus tested and a graph on semilog paper drawn between the deflection obtained in the case of the unbleached lac solution (1%) using photoelectric colorimeter and the blaech index found by the conventional method (Fig. 1).

To ascertain the dependability of the graph, several commercial seedlac samples were taken and their bleach indices determined by the present method. The bleach indices were also determined by the conventional method. The results obtained by the two methods were found to be identical.

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