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# Studies on Bleaching of Lac: Part III— An Improved Bleaching Technique

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A method for bleaching lac is reported in which the bleaching time is 4 hr compared to 24 hr in the conventional method. There is also substantial saving in the consumption of bleach liquor. An important feature of the method is that bleaching is done in fine suspension form as against the prevalent practice of doing this in solution form. The bleaching agent used is a mixture of hydrogen peroxide and sodium hypochlorite which gives a product with one-fourth to one-fifth the chlorine content of the product obtained by the conventional method.

IN an earlier work reported from this institute, Prasad and Khanna[1] tried hydrogen peroxide alone or in combination with hypochlorite for bleaching lac, but achieved partial success. Murray[2] reported that the mild oxidative action of hydrogen peroxide may be increased by the use of certain metallic catalysts and chelating agents. Activators like ferrous sulphate, copper sulphate, acetic anhydride, copper sulphate-pyridine-2-carboxylic acid were tried along with hydrogen peroxide. Only with the last mentioned system, some success was obtained.

Sengupta[3] reported that if lac is bleached while in fine suspension form as against solution form, the chances of chlorination are reduced, but the bleaching efficiency is enhanced. An attempt has, therefore, been made to bleach lac kept in fine suspension using a combination of hydrogen peroxide and sodium hypochlorite.

## Experimental procedure

Lac solution was prepared in sodium bicarbonate (15% on wt of lac) by extracting seedlac as reported earlier[4]. For obtaining a fine suspension of lac, the sodium bicarbonate extract of lac was treated with sodium chloride solution (10% wt/vol.) with vigorous stirring till a fine precipitate of the sodium salt of lac was obtained. Subsequently, sodium hypochlorite (3% available chlorine) was added. After 1 hr, hydrogen peroxide (10% wt/vol.) was added. Three hours later, the solution was diluted to 5% lac content and the temperature brought below 20°C. It was then precipitated with 5% sulphuric acid solution. The product

was thoroughly washed with water to remove acid and soluble salts and dried in shade at room temperature.

The methods of analysis were the same as described earlier[4].

**Table 1 — Effect of addition of activators during bleaching with hydrogen peroxide**

[*Rangeeni seedlac* (*colour index* 15) *used*]

| Activator used for 100 g seedlac | Qty added | Duration of reaction hr | Colour index of resultant product |
|---|---|---|---|
| Blank (only hydrogen peroxide 10% wt/vol., 150 ml added) | — | 18 | 4·5 |
| Ferrous sulphate | 0·1 g | 18 | 5 |
| Copper sulphate | 0·1 g | 18 | 7·5 |
| Cobalt sulphate | 0·1 g | 18 | 5 |
| Acetic anhydride | 2 ml | 18 | 12 |
| Copper sulphate + nitrilotriacetic acid | 0·1 g + 0·05 ml | 18 | Colloidal solution and lump formation on precipitation with dil. sulphuric acid |
| Cobalt sulphate + pyridine-2-carboxylic acid | 0·04 g + 0·02 ml | 18 | 4 |
| do | 0·04 g + 0·02 ml | 12 | 4·7 |
| do | 0·04 g + 0·02 ml | 6 | 5 |
| do | 0·05 g + 0·05 ml | 4 | 3 |

## Results and discussion

It is seen from Table 1 that of the activators tried, cobalt sulphate + pyridine-2-carboxylic acid gives the best performance, the colour index of the resultant product being reduced from 15 to 3 in 4 hr. Though the performance of the catalyst system improves with rise in temperature, temperatures above 40°C were not tried, since lac polymerizes at higher temperatures. It is evident from Table 2 that if lac is bleached in fine suspension and not in solution form, 100 ml of bleach liquor and 150 ml of hydrogen peroxide are sufficient to bleach 100 g of seedlac (bleach index 110 and colour index 15) in 4 hr. The bleached lac obtained has a colour index as low as 0·33. It has life under heat of 37 min, flow 38 mm and chlorine content 0·36%. Obviously, very little damage has been done to the resin molecule, which has life and flow comparable to those of the original seedlac. This can be attributed to a low chlorine content; it has been shown earlier[4] that chlorination affects the properties of the resin adversely. However, if the quantity of bleach liquor is further reduced from 100 to 85 ml, the life and flow increase further, but the colour index rises slightly from 0·33 to 0·4. The process worked out thus cuts down the quantity of bleach liquor needed. The bleach liquor required for 100 g seedlac is 100 ml as against 367 ml in the conventional method. Other advantages of the new process are: (i) the bleaching period is reduced from 24 to 4 hr; and (ii) the chlorine content of the resultant product is much lower (0·26-0·36% against 1·5% of the conventionally bleached lac). Because of the improved life under heat and flow, the bleached

**Table 2 — Characteristics of bleached lac obtained**

[*Rangeeni seedlac* (*colour index* 15) *used*]

| Qty of bleach liquor added (3%) to 100 g seedlac ml | Qty of hydrogen peroxide (10% wt/vol.) added ml | Temp. of bleaching °C | Bleaching period hr | Yield % | Colour index | Life at 150°C min | Flow mm | Chlorine content % |
|---|---|---|---|---|---|---|---|---|
| Original seedlac | — | — | — | — | 15 | 45 | 48 | — |
| 100 | 150 | 30-35 | 4 | 89 | 0·33 | 37 | 38 | 0·36 |
| 85 | 150 | 30-35 | 4 | 89·3 | 0·4 | 39 | 40 | 0·27 |
| 80 | 150 | 30-35 | 4 | 90 | 0·48 | 42 | 44 | 0·26 |

lac obtained is highly suitable for making colourless adhesives, sealing wax, etc.

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