

LATEX PRESERVATIVES

1. SOME PRELIMINARY EXPERIMENTS WITH SODIUM PENTACHLORPHENATE — "SANTOBRITE" —

BY

EDGAR RHODES

Introduction

The agent in general use as a latex preservative is ammonia, but certain users of preserved latex find its volatility and odour objectionable. Latex preserved with fixed alkalis is unpopular on other grounds and there have, for some time, been indications that a preserved latex containing only small quantities of ammonia and/or fixed alkalis might find markets.

All fresh field latex contains bacteria and the bacterial population increases at a great rate, producing acids which inevitably cause coagulation unless they are neutralized.

For successful preservation the latex must eventually be rendered sterile, otherwise coagulation by bacterial acids takes place, and the ideal preservative would be one which while itself having no adverse effects on the quality of the latex would, when applied in very small amounts, induce complete sterility in a few minutes, or in other words before dangerous amounts of bacterial acids had been produced. Such a latex disinfectant would be of very great value. Satisfactory preservation is obviously possible also with preservatives which are incapable of producing instantaneous sterility, provided the latex is given sufficient reserve of alkalinity to neutralise the bacterial acids produced during the hours or days which elapse before it becomes completely sterile.

Ammonia and the fixed alkalis do not induce sterility immediately, but if they are applied in sufficient amounts they provide in themselves sufficient reserve of alkalinity to neutralise the bacterial acids formed during the first few days before apparent sterility is induced. The bacterial population of latex and the effect of ammonia on it has been discussed in more detail by Beeley and Rhodes (1).

Earlier attempts to find preservatives alternative to ammonia and the fixed alkalis, have been mentioned by Rhodes (2), (3), (4) and (5) and in the course of this and later work it has become increasingly evident that most of the disinfectants which are extremely powerful at low concentrations in other liquid media, are less active in fresh latex, and require to be applied at much greater concentrations if they are to be even moderately effective.

Further, no non-alkaline disinfectant has yet been found which gives really satisfactory long period preservation in the total absence of some added ammonia or other alkali. Most non-alkaline disinfectants fail completely to preserve fresh latex in a fluid condition for longer than 24 hours at tropical temperatures, but many do so in the presence of 0.1 per cent of ammonia, which provides an alkali reserve during the first few days. The following quite arbitrary and apparently simple requirements have been used for some time at the Institute as a basis of first judgment on disinfectants:—

(i) When applied on the day of collection to latex containing 0.1 per cent ammonia in an amount not exceeding 0.3 per cent by weight calculated on the weight of latex, fluidity should be maintained for periods of at least three months at tropical temperatures and the latex should be found to travel satisfactorily in iron drums or tinned iron containers.

(ii) No dark-coloured deposits or discolouration should be produced, viscosity should be normal, and putrefactive odour and partial coagulation absent after a storage period of three months.

(iii) The disinfectant should preferably not be highly poisonous and the total cost of application should not exceed that of preservation with 0.75 per cent ammonia.

It has always been realised that a preservative which satisfied these minimum requirements might yet yield a preserved latex which would not be satisfactory in other respects, and the requirements have been used only as a first basis of judgment, satisfaction of them being taken to indicate no more than that the preservative was worthy of more extended trials.

Up to date a number of disinfectants have been found which easily satisfy the first requirement and notable among these are a number of organic mercury compounds of which mercuric cyanide is the best so far tested. In presence of 0.1 per cent ammonia this substance is effective when applied in amounts of the order of 0.05—0.10 per cent on the latex. No substance however (organic mercury compounds included) had until recently been found which appeared to satisfy all the requirements, and the following is a description of experiments with the first disinfectant which does appear to satisfy them reasonably well.

Experimental

PRESERVATIVE

The material used in the trials was supplied to us by the Monsanto Chemical Company, St. Louis, Missouri, U.S.A.; it consists of sodium pentachlorophenate and is known by the trade names of "Santophen 20 S" or "Santobrite." It is obtainable

either in the form of small brownish-grey crystalline flakes or as briquettes. The dust is irritating to mucous membranes and causes sneezing when breathed. It is freely soluble in water.

The fact of free solubility in water is an advantage; on many estates it is only with some difficulty that latex having a dry-rubber-content of 38—40 per cent as specified in most R.T.A. contracts can be obtained, and it is therefore important that the added preservative solution be as small in volume as possible so as not to reduce the dry-rubber-content of the preserved latex very appreciably. In all the experiments to be described the "Santobrite" was applied in the form of an 18 per cent aqueous solution. It can, however, if necessary, be used at a concentration of 25 per cent.

TRIALS WITH FRESH FIELD LATEX

In trials with fresh field latex the "Santobrite" solution was applied in amounts ranging from 0.1 to 0.75 parts solid "Santobrite" per 100 parts of latex. Typical results are given in Table I.

TABLE I

Parts Santobrite per 100 parts Latex	Days preserved in fluid condition
0.1	< 1
0.2	< 1
0.3	< 1
0.4	< 1
0.6	7
0.75	15

TRIALS WITH LIGHTLY-AMMONIATED LATEX

(a) *Laboratory Trials*

In these trials the "Santobrite" was applied to latex which had been ammoniated to approximately 0.1 per cent NH_3 , immediately on arrival from the field. Table II gives results obtained on small laboratory samples.

In confirmatory trials with 0.2 and 0.3 per cent "Santobrite" respectively on another lightly-ammoniated latex the sample containing 0.2 per cent "Santobrite" failed on the 95th day, while that containing 0.3 per cent "Santobrite" was still in good condition after 150 days.

TABLE II

Parts Santobrite per 100 parts Latex	NH ₃ content of Latex per cent.	Days preserved in fluid condition	Condition at 100 days or at failure
0.1	0.07	2	Coagulated
0.2	0.07	98	Coagulated
0.3	0.07	>100	Good colour No putrefaction
0.4	0.07	>100	Good colour No putrefaction
0.6	0.07	>100	Good colour No putrefaction
0.75	0.07	>100	Good colour No putrefaction

(b) *Small-scale Shipment-trial of preserved Latex*

This trial was made with a single 4-gallon lot in an unfilmed tinned-iron container. The trial lot was shipped to the London Advisory Committee for Rubber Research (Ceylon & Malaya), Imperial Institute, London, for examination. Details concerning the batch at the time of shipment are as under:—

"Santobrite" Content	...	0.2	parts per 100 parts latex
Ammonia Content	...	0.08	per cent
Total Solids	...	39.2	per cent
Dry-Rubber-Content	...	5.6	centipoises
Colour	...	...	Good white
Odour	...	...	Good

The trial lot arrived at its destination in good fluid condition, with good white colour and with no evidence of putrefaction. After storage for a further period in London its condition in respect of colour and odour five months after preparation in Malaya was apparently unchanged. The stability on receipt in London was somewhat below average for preserved latex but it was not dangerously low. Similarly the strength of the dried film was 670 lb./sq. in., which is below average for ammonia-preserved latex.

"SANTOBRITE" IN CREAM-PRESERVATION AND CREAMING

Trials were made with the object of exploring suitable conditions for the preservation of concentrated latex and the preparation of creamed latex of low alkalinity.

(a) *Laboratory Preservation Trials*

The results of preservation trials with (i) Centrifugal concentrate containing 60 per cent dry rubber and 0.1 per cent NH_3 , and (ii) Tragon cream latex containing 53 per cent dry rubber and 0.1 per cent NH_3 , are given in Table III.

TABLE III

Parts Santobrite per 100 parts latex	Centrifugal Concentrate		Tragon Cream Latex	
	Days preserved in fluid condition	Condition at 120 days or at failure	Days preserved in fluid condition	Condition at 120 days or at failure
0.10	>120	Good	85	coagulated
0.15	>120	Good	—	—
0.2	—	—	>120	Good
0.3	—	—	>120	Good

(b) *Laboratory Creaming Trials*

In the preparation of low-ammonia creams containing not more than 0.1 per cent ammonia, the choice of creaming agent is of some importance. Tragon seed gum (locust bean meal) is the creaming agent most commonly used in Malaya and its creaming efficiency is low at the low ammonia concentrations—0.2 per cent—required in the original latex in order to obtain a cream containing 0.1 per cent ammonia. Elsewhere in this issue details are given of a Rubber Research Institute patent for the use of tamarind seed as a creaming agent. The efficiency of this material is almost independent of the ammonia concentration of the latex and it therefore suggests itself as a suitable agent for the preparation of low-ammonia creams.

Whenever creaming is carried out in a latex containing not more than 0.2 per cent ammonia, there is a danger of the development of putrefactive odour either during the creaming period or shortly after, and on this account the presence of some additional disinfectant in the latex while creaming is in progress, is indicated.

Trials were made with tragon seed gum and with tamarind seed, in latices containing varying amounts of ammonia and "Santobrite," and it was found that, although the presence of "Santobrite" improved the creaming efficiency of tragon seed gum slightly at low ammonia concentrations, tamarind seed gave superior results. Rich creams free from putrefactive odour were obtained with tamarind seed from latex containing initially 0.1 per cent ammonia plus 0.3 per cent "Santobrite" calculated on the latex, and on the basis of these findings a batch of low-ammonia cream was prepared for shipment-trial. Details concerning this follow:—

(c) *Shipment-trial of "Santamcream"*

Two separate batches of cream were prepared and bulked together for shipment. In the preparation of each batch fresh latex was ammoniated to 0.1 per cent and treated with sufficient "Santobrite" to give 0.3 per cent calculated on the latex. The batch was then creamed by the application of sufficient of a 3-per-cent solution of tamarind seed to give 0.2 per cent of solid creaming agent calculated on the latex. After a creaming period of 48 hours in the case of the first batch and 72 hours in the case of the second, the cream was run off and treated with "Santobrite" solution sufficient to give a further 0.1 per cent "Santobrite" on the cream. The two batches of cream were combined and a 40-gallon trial-lot was shipped under the style of "Santamcream" to the London Advisory Committee in a black iron drum. At the time of shipment it had the following characteristics:—

Total Alkalinity due to Santobrite and ammonia		0.12 per cent calc. as ammonia
Ammonia content	...	0.055 per cent approx.
"Santobrite" content	...	0.25 per cent approx.
Total Solids	...	59.59 per cent
Dry-Rubber-Content	...	57.90 per cent
Viscosity	...	48.7 centipoises
Colour	...	Good white
Odour	...	Good.

It is reported that the trial batch arrived in London in good liquid condition, with excellent colour, and without putrefactive odour.

Discussion and Summary

It is evident from Table I that "Santobrite" alone is not suitable for the preservation of fresh latex. From Table II it is seen, however, that when applied in an amount equal to 0.3 per

cent, to latex freshly ammoniated to 0.1 per cent NH_3 , long-period preservation is possible. In spite of the fact that a small-scale trial-shipment containing only 0.2 per cent "Santobrite" travelled well and has maintained its good condition for five months, the results in Table II *et seq* are sufficient to indicate that 0.2 per cent "Santobrite" does not allow a sufficient margin of safety. An amount equal to 0.3 per cent "Santobrite" together with 0.1 per cent ammonia is considered desirable for the preservation of normal field latex.

"Santobrite" has been used successfully in the preparation and subsequent preservation of a trial batch of lightly-ammoniated creamed latex.

The total cost of preservation with "Santobrite" should compare favourably with that of simple ammoniation.

Literature Cited

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