



PATENT SPECIFICATION

NO. DRAWINGS

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COMPLETE SPECIFICATION

A method of Preventing the Coagulation of Concentrated Latex on Freezing

We, KEPONG PLANTATIONS LIMITED, a Company, Incorporated in the Federation of Malaya, of 71, St. Mary Axe, London, E.C.3, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of preventing the coagulation of concentrated latex on freezing.

Natural rubber latex concentrate and like latex concentrates solidify on freezing, and rarely recover to a usable liquid state upon thawing due to the coagulative, flocculative, or gelling tendencies which are brought to bear during the period in which the latex is at a temperature below its freezing point, about 0°C.

Because of this tendency to coagulate on freezing, latex concentrate which is imported into countries where low temperatures i.e. below 0°C, are experienced during the winter months, must either be prevented from freezing by transporting in heated vehicles and containers and kept in heated storage, or else some means of preventing coagulation must be found. Otherwise it becomes very difficult to make use of latex during the cold season in such countries, and imports must be confined to the warmer part of the year. This causes considerable difficulty to both the importer of the latex and the supplier, due to telescoping of the annual demand for latex into the middle months of the year, especially as the earlier ones are periods of low crop and production.

A number of additives including common salt, chlorinated phenols and stearates, have been used in attempts to stabilize concentrated rubber latex against coagulation on freezing, but with little success.

We have now found that concentrated rubber latex may be stabilized against coagulation on freezing by the addition of a small pro-

portion of a non-ionic organic surface active agent to the latex prior to exposure to freezing conditions.

Accordingly the present invention provides a method of preventing the coagulation of concentrated rubber latex as the result of freezing, which method comprises adding a non-ionic organic surface active agent to the latex prior to exposure of the latex to freezing conditions, the proportions of surface active agent being sufficient to stabilise the latex against coagulation on freezing but insufficient to protect the latex against coagulation on the addition of an acid.

Generally the proportion of surface active agent added in the method of the present invention will be from 0.05% to 1% by weight on the weight of the latex, and more usually from 0.1% or 0.2% to 0.7% by weight. Preferably the proportion of stabilizer added is from 0.25% to 0.5% by weight, and most preferably 0.4% by weight.

The proportion of stabilizer added will to some extent depend on the length of time for which the latex is exposed to freezing conditions and on the particular stabilising characteristics of the stabilizer. Although proportions below 0.1% by weight are mentioned above, these will not in general be useful where the latex is to be exposed to freezing conditions for more than, for example, 24 hours; and although proportions as high as 1% are mentioned above these again will in general not be used as they are likely to be also sufficient to prevent coagulation on the addition of an acid. For example, in British Specification No. 744,688 there is disclosed a typical method of stabilising a natural rubber latex against coagulation during concentration under acid conditions by the use of non-ionic surface active agents. The proportion of non-ionic surface active agent is said to be advantageously between 0.5 and 5% by weight on the total solids content of the latex, that is from 0.81% to 8.1% by weight on the weight of the latex for a typical

[Price 4s. 6d.]

5 latex containing 61.5% total solids. It is to be understood that in the method of the present invention the proportion of surface active agent must never be sufficient to stabilise against acid coagulation as in the method disclosed in the above-mentioned specification. If 0.81% of a particular surface active agent will stabilise against acid coagulation, then it will be appropriate in practicing this invention to use a smaller proportion e.g. 0.25%, to stabilise against coagulation on freezing.

10 The method of the invention will be most useful in relation to natural rubber concentrates which are produced at certain times of the year in accordance with crop production, but the method may be used to stabilize synthetic latices against coagulation on freezing and is not limited to natural rubber latices.

15 The preferred non-ionic organic surface active agents for use in the method of the invention are esters of polyhydric alcohols with long chain carboxylic acids e.g. C_{10} to C_{30} , esters of long chain alcohols e.g. C_{10} to C_{30} , with polyhydroxy acids and esters of hydroxy alkyl ethers, particularly those in which the hydroxy alkyl ether is a condensation product of ethylene oxide type. Other ethylene oxide condensation products such as those with alkyl phenols e.g. nonyl phenol, may also be used.

20 The non-ionic organic surface active agent be added to the latex before or after concentration, provided that the concentrated latex contains a sufficient proportion of the surface active agent to prevent coagulation thereof on exposure to freezing conditions, but insufficient to prevent coagulation on the addition of an acid.

25 Following is a description by way of example to further illustrate the method of the present invention.

EXAMPLE 1

30 Two samples of standard latex concentrate of the type known as FULL AMMONIA (i.e. containing 0.7% ammonia as a preservative) and two samples of standard concentrate of the type known as LOW AMMONIA (i.e. containing 0.2% ammonia and 0.25% of a secondary preservative, in this case boric acid) were taken from production of a factory engaged in

35 latex processing. One sample of each type was used as a control, and to each of the others was added 0.25% of a non-ionic organic surface active agent as known commercially as Ethomeen 18/60 stabilizer. The four samples were then placed in 'deep freeze' cabinet and frozen at a temperature below -20°C , and retained in this state for more than one week.

40 On being removed from the deep freeze cabinet all four samples were in a completely solid state. Upon being thawed the two control untreated samples remained in a solid condition, having coagulated, or gelled, during the freezing. The two treated samples however, returned to a normal liquid state and showed no signs of coagulative or flocculative tendencies.

EXAMPLE 2

45 A sample of standard production ammonia preserved liquid latex concentrate was divided into 17 aliquots. One aliquot was designated N.C. and was used as a normal control sample kept at normal temperature, in this instance between 20°C and 27°C . A second aliquot designated F.C. was used as a frozen control sample. The remaining 15 aliquots were divided into three lots of five each, each lot being treated by the addition of a different proprietary non-ionic organic surface active agent as stabilizer, and at different incremental amounts based upon percentage of weight of the stabilizer on the total weight of the latex treated.

50 With the exception of the normal control sample which remained at normal temperature, all samples were placed in an insulated freezing chamber which reduced the temperature below the point at which the latex reached a frozen immobile state. The frozen samples were kept in the freezing chamber which was maintained at a temperature below -15°C , for varying periods of time. On removal from the freezing chamber the samples were allowed to thaw out and return to the temperature at which the normal control sample was held. The condition upon thawing was then noted, and mechanical stability tests were carried out with a standard Klaxon MS Tester under stan-

standard conditions, at 24 hours after returning to normal temperature and again at 5 days after remaining at normal temperature. The normal control sample was similarly tested for comparison. The results of the tests are set out in the Table below:

Aliquot No.	Sample Details	% Stabilizer Added	Time Frozen	Condition on Thawing	(MST) Mechanical Stability at 24 hrs	Time at 5 days
NC	Normal Control	Nil	Nil	—	820	820
FC	Frozen Control	Nil	1 day	Coagulated	—	—
1	Proprietary Stabilizer	'A' 0.1	5 days	Coagulated	—	—
2	"	'A' 0.2	5 days	Liquid	240	760
3	"	'A' 0.3	7 days	Liquid	290	840
4	"	'A' 0.4	7 days	Liquid	340	400
5	"	'A' 0.5	7 days	Liquid	360	420
6	"	'B' 0.3	7 days	Slightly Viscous	210	240
7	"	'B' 0.4	7 days	Liquid	375	480
8	"	'B' 0.5	7 days	Liquid	305	500
9	"	'B' 0.6	7 days	Liquid	295	440
10	"	'B' 0.7	7 days	Liquid	300	420
11	"	'C' 0.3	7 days	Some Coagulum	—	—
12	"	'C' 0.4	7 days	Liquid	410	420
13	"	'C' 0.5	7 days	Liquid	440	600
14	"	'C' 0.6	7 days	Liquid	480	680
15	"	'C' 0.7	7 days	Liquid	660	715

The proprietary stabilizers used were as follows:

10 "A" was Vulcastab LW marketed by I.C.I. Ltd.

"B" was Oxirane SD 50.

and "C" was Ethomeen 18/60 marketed by the Armour Company.

15 These stabilizers are all proprietary esters of ethylene oxide condensation products. The words "Ethomeen" and "Vulcastab" are Registered Trade Marks.

20 As can be seen from the above Examples adequate stabilization can be obtained against coagulation of concentrated latex to be transported or stored at temperatures below the

freezing point of the latex. The properties of latices thus stabilized were not adversely affected and the latices were capable of being further processed as is known in the art. It is to be understood that the invention includes a rubber latex when treated by the method of the invention and processed rubber when made from this latex.

WHAT WE CLAIM IS:—

1. A method of preventing the coagulation of concentrated rubber latex as the result of freezing, which method comprises adding a non-ionic organic surface active agent to the latex prior to exposure of the latex to freezing

dard conditions, at 24 hours after returning to normal temperature and again at 5 days after remaining at normal temperature. The normal control sample was similarly tested for comparison. The results of the tests are set out in the Table below: 5

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WHAT WE CLAIM IS:—

1. A method of preventing the coagulation of concentrated rubber latex as the result of freezing, which method comprises adding a non-ionic organic surface active agent to the latex prior to exposure of the latex to freezing



- conditions, the proportion of surface active agent being sufficient to stabilise the latex against coagulation on freezing but insufficient to protect the latex against coagulation on the addition of an acid.
- 5 2. A method as claimed in claim 1 wherein the proportion of surface active agent added to the latex is from 0.25% to 0.5% by weight on the weight of the latex.
- 10 3. A method as claimed in claim 2 wherein the proportion of surface active agent added to the latex is 0.4% by weight on the weight of the latex.
- 15 4. A method as claimed in any one of the preceding claims wherein the surface active agent is an ester of a polyhydric alcohol with a long chain carboxylic acid, an ester of a long chain alcohol with a polyhydroxy acid, or an ester of an hydroxy alkyl ether.
5. A method as claimed in claim 4 wherein the ester of the hydroxy alkyl ether is an ester of an ethylene oxide condensation product.
6. A method as claimed in any one of claims 1 to 3 wherein the surface active agent is a condensation product of ethylene oxide and an alkyl phenol, for example, nonyl phenol.
- 25 7. A method as claimed in claim 1 and substantially as hereinbefore described with reference to the specific Examples.
8. Rubber latex when treated by a method as claimed in any one of the preceding claims.
- 30 9. Processed rubber when made from the latex claimed in claim 8.
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