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(54) DISPERSIBLE NATURAL RUBBER

(71) We, THE RUBBER RESEARCH INSTITUTE OF MALAYA, a Body Corporate of Malaysia, of 260 Jalang Ampang, Kuala Lumpur, Malaysia, 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 the preservation of natural rubber latex in the form of re-dispersible solids or low moisture content pastes.

Rubber in the form of its latex is an important material in the production of soft and foamed rubber goods, the manufacture of which is normally performed in places far removed from the source of the latex. In order to prevent deterioration on storage whilst travelling and to reduce the bulk of the transported material, latex is usually shipped in the form of a preserved concentrate. The usual preservative is ammonia and the latex is concentrated to between 60 and 70% solids. An increase in the solids content of the transported latex would bring benefit both from the reduced amount of preservative required and the reduced bulk of the transported material.

The present invention therefore provides a method of making a solid or paste of natural rubber which is dispersible in water, which method comprises providing a whole natural rubber latex, as hereinafter defined, in admixture with a redispersing agent combination which includes at least one compound selected from at least two of the groups:

- (a) glycosides and urea,
- (b) mono- and di-saccharides, and
- (c) alkali metal and ammonium salts of organic acids having a C₇ to C₂₀ aliphatic carbon chain, and removing water from the latex.

The invention also includes redispersible natural rubber in solid or paste form when made by the process of the invention.

It is preferred that the re-dispersing agent combination includes at least one compound selected from group(c). Preferably, the re-dispersing agent combination is present in an amount of from 3 to 20 parts by weight, and includes at least one compound selected from groups (a) and (b) in an amount of from 1 to 15 parts by weight, and at least one compound selected from group (c) in an amount of from 1 to 15 parts by weight, per 100 parts by weight of the dry rubber in the latex. While it will normally be preferred to use the minimum quantity of the re-dispersing agent necessary to confer adequate redispersibility on the solid rubber, there is no reason in principle why greater amounts of the re-dispersing agent should not be used. The maximum concentration of re-dispersing agent is thus not critical, and will generally be that at which other properties of the rubber start to deteriorate significantly.

For component (a) the preferred glycosides are the saponins including digitonin. Compared with these tannic acid has proven relatively ineffective. The preferred mono- and disaccharides include d(+) glucose, fructose, d(+) galactose, l(+) arabinose, d(-) mannose and lactose.

For component (c) the preferred compounds include potassium palmitate, the compound sold under the Trade Mark Vulcastab LS (I.C.I.) believed to be sodium oleyl para-anisidine sulphonate and the ammonium, sodium and potassium salts of capric, caprylic, lauric, stearic, ricinoleic and linoleic acids. These last-mentioned salts can be used either by themselves or in various combinations. Convenient sources of such combinations are the natural vegetable oil soaps, e.g. coconut oil soap and castor oil soap.

The invention is applicable to whole natural rubber latex irrespective of the solids content, although clearly it is advantageous to start with a latex which is concentrated as this reduces the amount of energy required to remove the residual water. The method is thus applicable to fresh field, diluted field,

concentrated and preserved concentrated latices.

By referring to 'whole natural rubber latex' we mean a natural rubber latex that includes non-rubber components as present in latex as tapped. The invention does not include the use of purified latices which have had the non-rubber components removed e.g. by dialysis;

The method used to dry the treated latex is not critical but in commercial operation the normal spray drying techniques are satisfactory. The specific examples detailed in the table use a laboratory method of drying the rubber as thin films on glass plates.

The method used in the Experiments is as follows:

To portions of the natural rubber latex under test containing 10 gm. dry rubber, are added varying quantities of an aqueous solution of the re-dispersing mixture, typically

at about 10% by weight, and the mixtures are thoroughly stirred. The mixtures are dried on glass plates of 27.5 × 32.5 cm. (11" × 13") at ambient temperature ca. 29° C. for 16–20 hours. The dryness of the films is assessed by their transparent appearance. Using this method the dry films typically have moisture contents of from 0.8 to 2.0% by weight. The treated films are slightly darker coloured than the control. Distilled water is then poured on the films and after one minute, the extent of re-dispersibility of the dry rubber is assessed by the appearance of a milky suspension and quantity of the rubber coagulum which is non-dispersible.

Examples 1 to 7.

Various combinations were investigated to see if re-dispersible latices could be made by the method outlined above. The results are given in Table 1.

TABLE 1

Example	Component (a)	Component (b)	Appearance on addition of water to dry rubber	Coagulum content % wt.
	Control rubber	Nil	Film was coherent and white in colour.	100
1	1 phr saponin	5 phr Vulcastab	Film was completely non-coherent, very milky dispersion of latex particles.	0
2	5 phr saponin	5 phr potassium palmitate	— ditto —	0
	Nil	5 phr Vulcastab LS	Film was coherent	100
	Nil	5 phr potassium palmitate	— ditto —	100
3	3 phr glucose	2 phr Vulcastab LS	Film was completely non-coherent, very milky dispersion of latex particles.	0
4	5 phr glucose	5 phr potassium	— ditto —	0
5	5 phr sucrose	5 phr potassium palmitate	— ditto —	0
6	2 phr saponin	5 phr glucose	— ditto —	0
7	5 phr glucose	5 phr coconut oil soap	— ditto —	0
	5 phr glucose	Nil	Film was coherent	100
	5 phr sucrose	Nil	— ditto —	100
	Nil	5 phr coconut oil soap	— ditto —	100

Similarly, good results have been obtained with the following combinations:—

- 2 phr Vulcastab LS plus 5 phr glucose
- 3 phr Vulcastab LS plus 3 phr glucose
- 5 phr Vulcastab LS plus 2 phr glucose
- 5 phr potassium oleate plus 5 phr glucose
- 5 phr potassium palmitate plus 3 phr glucose
- 1 phr saponin + 3 phr Vulcastab LS
- 2 phr saponin + 5 phr Vulcastab LS

The behaviour of these chemicals has been found almost identical irrespective of the type of latex concentrate, i.e. fresh and matured latex preserved with ammonia alone or in combination with sodium pentachlorophenate or boric acid.

Example 8.

A commercially available high-solids NR

latex concentrate, Revertex S ('Revertex' is a Registered Trade Mark), purported to contain 0.05% by wt potassium hydroxide and 2% by wt. potassium coconut oil soap formed a paste with the further addition of 3% by wt. potassium coconut oil soap and 10 to 30% by wt. of any of the following saccharides, viz. glucose, fructose, sucrose, lactose, sorbitol and commercial grade brown sugar.

Example 9.

Large quantities of the following reconstituted NR latices were prepared as above, except that when the pastes were dried to an average moisture content of 0.8% wt. the rubber was recovered by first adding water to each and stirring with a spatula subsequently. The raw latex properties are shown in Table 2.

TABLE 2

	Total solids content % wt.	Dry rubber content % wt.	pH	MST (sec)	Brookfield viscosity (cps)
HA latex concentrate (control)	61.83	60.01	10.52	160	170
Reconstituted NR latex treated with 5 phr potassium palmitate plus 5 phr sucrose	58.29	52.69	10.65	>2000	760
Reconstituted NR latex treated with 10 phr potassium palmitate plus 10 phr sucrose	60.29	55.89	10.95	1260	540

The aqueous dispersions of successfully reconstituted latices have been examined under the light microscope. Normal latex particles were observed, though in some cases there were fair amounts of particle flocs small enough to look redispersed on mechanical shaking. Samples examined under the electron microscope confirmed that the particles look similar to the normal rubber particles.

WHAT WE CLAIM IS:—

1. A method of making a solid or paste of natural rubber which is dispersible in water, which method comprises providing a whole natural rubber latex, as hereinbefore defined, in admixture with a redispersing agent combination which includes at least one compound selected from at least two of the groups:

- (a) glycosides and urea,
- (b) mono- and di-saccharides, and
- (c) alkali metal and ammonium salts of organic acids having a C₁ to C₃₀ aliphatic carbon chain, and removing water from the latex.

2. A method as claimed in claim 1, wherein the redispersing agent combination includes at least one compound selected from group (c).

3. A method as claimed in claim 2, wherein the redispersing agent combination is present in an amount of from 3 to 20 parts by weight, and includes at least one compound selected from groups (a) and (b) in an amount of from 1 to 15 parts by weight and at least one compound selected from group (c) in an amount of from 1 to 15 parts by weight, per 100 parts by weight of the dry rubber in the latex.

4. A method as claimed in any one of claims 1 to 3 and substantially as hereinbefore described in any one of Examples 1 to 9.

5. A solid or paste of natural rubber which is dispersible in water, when made by the method claimed in any one of claims 1 to 4.



Similarly, good results have been obtained with the following combinations:—

- 2 phr Vulcastab LS plus 5 phr glucose
- 3 phr Vulcastab LS plus 3 phr glucose
- 5 phr Vulcastab LS plus 2 phr glucose
- 5 phr potassium oleate plus 5 phr glucose
- 5 phr potassium palmitate plus 3 phr glucose

- 1 phr saponin + 3 phr Vulcastab LS
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5. A solid or paste of natural rubber which is dispersible in water, when made by the method claimed in any one of claims 1 to 4.



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