PATENT SPECIFICATION

586,830

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(Under Section 91, sub-sections (2) and (4) of the Patents and Designs Acts, 1907 to 1946, a single Complete Specification was left in respect of this Application and of Application No. 6518/40 and was laid open to Inspection on Oct. 13, 1940).

COMPLETE SPECIFICATION

Improvements in and relating to the Treatment of Latex

(A communication from abroad from Centrale Vereeniging tot Beheer Van Proefstations Voor de Overjarige Culturen in Nederlandsch-Indie, an Association incorporated under Dutch law, of Gebouw Factory, Stationsplein, Batavia-Stad, Dutch East Indies).

I, Henry Withers Kickweed Jennings, a British Subject, of 51 & 52, Chancery Lane, London, W.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

It is well known that the protein present in latex occurs partly in the serum and partly adsorbed by the rubber particles.

The part present in the serum can easily be removed by repeatedly centrifuging or creaming the latex.

The other part, however, which is adsorbed by the rubber particles is so firmly united therewith that these proteins still remain adsorbed by the rubber after each centrifuging or creaming operation.

For this reason it is not possible either by repeated centrifuging or by repeated creaming alone to reduce the protein content of the rubber below a certain amount. (See R. J. Noble I.R.I. Rubber Techn. Conf. May 1938, Paper No. 25).

The present invention enables the content of proteins adsorbed by the particles of rubber to be reduced by transferring part of these proteins into the serum from which they can readily be removed, for example by centrifuging or creaming operations. For this purpose the principle of adsorption displacement, i.e. exchange by adsorption, is used.

According to the invention, the process comprises diluting the latex, adding to the diluted latex a capillary-active substance which is more strongly adsorbed by the rubber particles than the proteins, allowing the mixture to stand for some hours and then separating the latex from the serum by creaming or centrifuging.

Owing to the dilution of the latex the protein concentration is lowered and consequently the protein adsorption is reduced and the proteins are more easily displaced by the capillary-active substance.

For displacing the proteins there may be used any substance which is more strongly adsorbed by rubber than the latex proteins. Soaps, such as sodium, potassium or ammonium salts of the higher fatty acids or naphthenic acids can advantageously be used. Also suitable for the purpose are the water-soluble sulphates and sulphonic acids derived from the higher alcohols, of polyglycerol esters, saponines and related substances and also other substances known as wetting or emulsifying agents, as well as colloidal solutions of phosphatides, lipins and lipoids.

As regards the concentration of the latex, it may be mentioned that, in order to effect the greatest possible purification, the latex must be considerably diluted, and the cream obtained should be as concentrated as possible. Therefore centrifuging is in this respect better than creaming.

The addition of soaps to latex before centrifuging has long been known. The object was, however, to improve the mechanical stability of the latex (Noble "Latex in Industry", page 130). In creaming processes soaps have also sometimes been used, but the latex was not diluted before the addition of the creaming agent, and therefore only a very small amount of the protein could be displaced even if the other factors were selected to be as favourable as possible. Moreover, as compared with known creaming processes, the amount of soap used in the process of the present invention is considerably smaller.

In the process according to the invention the function of the soap is, however, entirely different namely that of an adsorption exchange agent.

That the process is quite different is clear from the fact that the displacement of the proteins from the adsorption layer requires some time. If the centrifuging is effected directly or shortly after the addition of the soap the adsorbed proteins are not removed. The removal of the proteins takes place only if the latex is kept in contact with the soap for some time, for example at least one night (see Example 3), after its addition.

Owing to the incorporation of soap the fatty acid or naphthenic acid content of the latex and the rubber prepared therefrom is increased. During the centrifuging process for separating the rubber from the serum a large part of the fatty acid or the like is removed with the serum; the final product, however, still contains an increased fatty acid content. In rubber obtained by coagulation with acid a large part of the soaps used for displacing the proteins by adsorption is converted into the free acid.

According to a further feature of the invention the amount of fatty acid or the like, especially of the free acids, is reduced by treating the rubber sheets produced from the latex of which the protein content has been decreased with a solution of an alkaline compound. Very suitable for this purpose are ammonia and also dilute alkali solutions.

If the coagulation has been effected by other means than the addition of acid, the fatty or naphthenic acids or sulphonated compounds are still present in the rubber in soluble condition, they can be removed therefrom with the aid of water or other solvents for the salts.

Preferably, the rubber while still wet and suitably in the form of thin sheets is extracted in the alkaline liquid, for example in 0.5% ammonia solution. The extraction period depends on the thickness of the sheets, the amount of fatty acid to be removed, the concentration of the extraction agent, the temperature and other conditions. After an extraction for a period of approximately 10 hours a decrease of the fatty acid content of about 40% may be obtained.

In many cases it is desirable to add anti-oxidants in order to improve the ageing properties of the purified latex or of the rubber prepared therefrom.

The invention will now be explained by the following examples. In all the Examples the term DRC means dry rubber content, the term TS means total solids content and the term N-content means nitrogen content.

EXAMPLE 1.

This example shows that when the latex is treated with ammonium oleate before centrifuging, the crepe prepared from the centrifuge cream has a lower nitrogen content than when the ammonium oleate treatment has not taken place.

As the starting material a latex was used with a dry rubber content = 29.5% and a total solids content = 32.6%. The nitrogen-content of the crepe obtained in the usual manner after coagulation amounted to 0.52%.

A. A part of the latex was diluted with five times its volume of water containing 10 c.c. of strong ammonia per litre.

B. Another part was diluted in the same manner with aqueous ammonia, which, however, also contained 0.5 g ammonium oleate per litre of water.

C. A third part was diluted in the same manner as B; here, however, the ammonium oleate concentration amounted to 1 g per litre.

The three differently treated portions were allowed to stand overnight and were then centrifuged. The following figures were obtained for the dry rubber and total solids content of the cream and the nitrogen content of the crepe prepared from the cream.

A. Cream: DRC = 54.2%; TS = 54.4%; N-content of crepe from cream 0.15%

B. ,, ,, = 50.4%; ,, = 50.5%; N-content of crepe from cream 0.12%

C. ,, ,, = 54.2%; ,, = 54.4%; N-content of crepe from cream 0.09%

Before coagulation the cream was diluted to a DRC of about 10% in each case.

EXAMPLE 2.

This Example is similar to Example 1 but, instead of ammonium oleate, the soap known under the registered Trade Mark "Sunlight" was used in the concentration of 1 g per litre of diluted latex.

Starting latex DRC = 32.6%; TS = 35.5%

800 cc. of this latex were mixed with 5.5 litres of water containing 60 c.c. of ammonia.

After centrifuging this gave a cream with DRC = 49.8% and from this a crepe was prepared with a N-content of 0.14%.

A similar experiment, but with the aforesaid addition of soap to the diluting water gave on centrifuging after stand-

ing overnight a cream with DRC = 52.2% and from this cream a crepe was prepared with a N-content of 0.09%.

EXAMPLE 3.

This Example shows that it is essential to contact the latex for some time with the capillary-active substance because the adsorption displacement is a process which takes place slowly.

Starting latex DRC = 27.5%; TS = 28.9%. Crepe prepared herefrom N = 0.52%; Acetone extract = 2.76%.

The following mixture was prepared:

Latex	4 litre
Ammonia	30 c.c.
Ammonium stearate	30 g
Water	12 litre

(Since ammonium stearate dissolved with difficulty, this substance had to be mixed beforehand with a little hot water).

A. Directly after the mixture had been prepared a part was separated and centrifuged. A cream was obtained with a DRC of 55.8% from which a crepe was prepared with N-content of 0.13%, which is not particularly low.

B. The remainder of the mixture was kept till the following day and then centrifuged. The cream had a DRC of 56.1% and from it a crepe was prepared with a N-content of 0.10%.

EXAMPLE 4.

This Example shows how, by starting from a cream previously purified by a single centrifugal treatment (without addition of soap) diluting this cream, and then treating with soap and again centrifuging a crepe having very low nitrogen content can be prepared from this second cream.

A. A cream obtained by centrifuging an ammoniated latex was diluted to a DRC = 5% and treated with "Sunlight" soap in a concentration of 2 g per 1 litre mixture. After standing for some time the mixture was centrifuged; from this a cream was obtained with a DRC of 29.9% and from the cream a crepe with a N-content of 0.03% was prepared.

B. Another part of the centrifuge cream was diluted to a DRC of about 7%, treated with ammonium stearate in a concentration of 1 g per litre of diluted latex. On centrifuging again a cream was obtained with a DRC of 64% and from the cream a crepe having a N-content of 0.05% and an ash content of 0.06% was prepared.

As is well known, a relatively small decrease in the protein-content, of for example 0.01% N in the rubber, is of considerable importance in particular for special purposes.

Rubbers poor in protein such as are obtained by the process of the invention are particularly suitable for use in the production of cables.

The water adsorption of some of the crepes prepared by the processes described in the foregoing examples was determined by a method devised at the Proefstation West-Java at Buitenzorg. The results obtained for a standard crepe and for crepes having a low protein content prepared from latex treated in accordance with certain of the preceding examples are given in the following table, the crepe in one case being treated with soda lye.

Sample	Ash %	Nitrogen %	Water adsorption (mg/100 cm²) at 80° C. Raw rubber 7 hours	Raw rubber 24 hours	Vulcanized rubber 7 hours	Vulcanized rubber 24 hours
Standard crepe	0.19	0.45	243	537	147	320
Crepe of Example 3B	0.07	0.10	63	137	62	120
Crepe of Example 4B	0.06	0.05	—	—	40	81
Crepe of latex treated with lye	0.11	0.09	60	121	58	112

The term latex in this specification and claims includes not only latices of common rubber but also those of gutta percha, balata and similar natural rubber-like substances.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process for the preparation of latex having a low protein content which comprises diluting the latex, adding to the diluted latex a capillary-active substance which is more strongly adsorbed by the rubber particles than the proteins, allowing the mixture to stand for some hours and then separating the latex from the serum by creaming or centrifuging.

2. A process according to Claim 1, in which the capillary-active substance is a soap.

ing overnight a cream with DRC = 52.2% and from this cream a crepe was prepared with a N-content of 0.09%.

EXAMPLE 3.

This Example shows that it is essential to contact the latex for some time with the capillary-active substance because the adsorption displacement is a process which takes place slowly.

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B. The remainder of the mixture was kept till the following day and then centrifuged. The cream had a DRC of 56.1% and from it a crepe was prepared with a N-content of 0.10%.

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2. A process according to Claim 1, in which the capillary-active substance is a soap.

* C L M S *

3. A process according to Claim 1 or Claim 2, in which the capillary-active substance is a sulphonated compound.

4. A process in accordance with any one of the preceding claims, wherein the latex is first purified, for example by centrifuging or creaming, and the purified material, for example diluted cream, is used as the starting material.

5. A process for the preparation of rubber having a low protein content, wherein the product obtained by treating latex by a process claimed in any of the preceding claims is used as the starting material and converted into rubber.

6. A process for the removal of foreign substances from rubber obtained by the process claimed in Claim 5, according to which the rubber, preferably while still in a wet condition and in the form of thin sheets, is extracted with a liquid in which the substances to be removed are soluble.

7. A process according to Claim 6, according to which fatty acids present in the rubber are removed by extracting the rubber with an alkaline solution, for example a 0.5% aqueous ammonia solution.

8. Processes for the production of latex and rubber having a low protein content substantially as described.

9. Latex and rubber having a low content of proteins when produced by a process claimed in any of the preceding claims or by a chemical equivalent of such a process.

Dated this 10th day of April, 1940.
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