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PROCESS FOR THE REMOVAL OF NOXIOUS METAL COMPOUNDS FROM RUBBER OR SUBSTANCES SIMILAR TO RUBBER, AND FROM DISPERSIONS THEREOF

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It is well known that minute quantities of certain metal compounds, such as copper, manganese, or iron salts, deleteriously affect the durability of crude or vulcanized rubber. In actual practice, therefore, limits have been fixed for the quantity to be tolerated of any such metals.

Furthermore it is known that minute quantities of the abovementioned metal compounds are present also in rubber dispersions. Certain kinds of latex, when freshly collected, already have a fairly large copper content. The metal compounds present in latex are usually in part dissolved, and in part they are in a non-dissolved state, that is to say that they are adsorbed to the rubber particles, dispersed in the serum, or precipitated onto or in the rubber particles. The aim of the invention is to cause the noxious insoluble metal compounds to become soluble, and to remove the same.

Upon coagulation, about half of the metal compounds present remain in the serum, the remainder being left in the rubber.

The metal compounds, more specifically the copper compounds, have a deleterious effect upon the ageing properties of rubber, though this noxious influence is partly counteracted again by the so-called anti-oxidants, substances occurring in natural latex, and which protect it against depolymerisation or oxidation. If, however, one has to deal with purified rubber, such as is used for electrical purposes for example, then the anti-oxidants have as a rule been removed, so that the noxious influences of these metal compounds become increasingly noticeable.

In purifying rubber dispersions through hydrolysing the non-rubber components, as for example through heating with caustic potash, the metal compounds are decomposed in the course of the hydrolysis and almost entirely converted into compounds which, upon the coagulation of the latex, form insoluble compounds, so that a considerable proportion of the metals, such as the copper referred to, is retained in the purified rubber. Presumably the copper precipitates in the shape of sulphuretted compounds. Through hydrolysis sulphide ions are poduced by the non-rubber components.

To enhance the durability of rubber it is of importance to obtain a product with a low content of noxious metals, more specifically a low copper content. Thus it is desirable to endeavour to decrease the metal content of rubber, and obviously more specifically that of rubber varieties with a high metal content. The high metal content of rubber may be due to a variety of causes, for example to the high metal content of crude latex, or to contamination in the course of the preliminary treatment of the latex. Synthetic dispersions as a rule contain noxious metal compounds derived from the factory plant.

Dissolved metal compounds may be removed, together with the serum components, by means of creaming, centrifuging, or other known processes. The coarser particles of metal compounds that may be present in the serum, can be removed through clarification.

Now the invention refers to a process by means of which the metal compounds, and more specifically the copper compounds present in the latex or in the rubber particles in an insoluble state, can be converted into soluble compounds, thereupon to be removed by the methods known in connection with the removal of soluble compounds present in rubber dispersions.

According to the invention the dissolving of metal compounds is effected by converting them into soluble complex compounds, and by thereupon removing the compounds thus made soluble, as for example through dialysis, creaming, centrifuging, adsorption, or in any other known way.

A very suitable method of converting metal compounds into soluble complex compounds is by treating the rubber dispersion with a cyanide.

Copper compounds can also be converted into ammonia or hydroxyl complexes, provided no sulphide ions be present in the liquid.

The dissolving of insoluble metal compounds can also be effected simultaneously with other processes, for example at the same time that hydrolysis is taking place, as in the case of a treatment with caustic potash, or when some other purifying treatment is being applied.

The dissolving of a noxious metal present in a rubber dispersion will in actual practice have to be effected in an alkaline medium, in view of the stability conditions of the rubber dispersion. Also the removal of the metal complexes will have to be effected in an alkaline medium, that is to say, therefore, prior to coagulation, which usually is effected in an acid medium.

Through a process such as is indicated above, it may be possible to reduce, for instance, the copper content of rubber to one fourth of the original amount present.

The quantity of cyanide to be applied is preferably to be kept as small as possible. Experiments have shown that very minute quantities, say 30 mg per litre, already suffice to reduce the copper content quite considerably. Thus it was

found, for example, that the copper content per 100 g of rubber had been reduced from 0.86 mg to 0.51 mg. In actual practice quantities of from 0.1–0.2 g of cyanide per litre are to be recommended. By adding this quantity a reduction, for example, from 0.86 mg to 0.23 mg of copper per 100 g of rubber is effected.

Through heating the dispersion, after cyanide has been added, the solution of the metals, such as that of copper, is promoted, whilst it also makes it possible to use only small quantities of cyanide. If the dispersion is not heated, then it will be necessary to apply a larger quantity of cyanide for a reduction of the metal content down to 0.2–0.25 mg of copper per 100 g of rubber.

Copper that has been made soluble can be removed, along with other serum substances, in various ways, such as through centrifuging, creaming, dialysing, adsorption, ultra-filtration, etc. Its removal through creaming with konnyaku meal is particularly suitable, seeing that this makes it possible to effect a very marked decline in the copper content of the final rubber product.

It is probable that copper is adsorbed onto the konnyaku meal, and that this causes the considerable decline in the copper content.

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