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FILLER MASTER BATCH FROM FRESH NATURAL RUBBER LATEX

The present finding relates to a process of preparing a natural rubber carbon black or carbon black silica dual filler master batch.

INTRODUCTION

Filler incorporation causes a considerable change in the dynamic properties of rubber, for both modulus and hysteresis. Though carbon black is usually dispersed in natural rubber by the conventional mill mixing technique, there are accompanying issues such as air pollution and higher energy consumption. In the case of silica it is extremely difficult to disperse the filler aggregates using a mixing mill without the aid of other additives like coupling agents. For carbon black, preparation of latex-carbon black master batch by the addition of carbon black as a slurry has been suggested as one of the methods to avoid some of these problems. To be economically viable, fresh NR latex needs to be used and it is essential to ensure that both latex and the carbon black slurry coagulate simultaneously to avoid loss of filler during coagulation. In most of the earlier cases reported, natural rubber latex is pretreated or various modifications are performed like cleavage of amide linkages, hydrolysis of proteins by enzymes, addition of monomer units etc., to prepare the master batch. Further these processes make use of different types of processing oils, and techniques like high flow rate of slurry and mixing under turbulent conditions for coagulation of the latex containing the filler slurry.

There exists a need for a very simplified and economic process for the production of master batches that gives vulcanizates with comparable or superior mechanical properties compared to mixes prepared by conventional mill mixing process.

OBJECTIVE

The objective is to develop a process for the preparation of filler incorporated natural rubber latex master batch by utilizing a quick coagulation process of latex, assisted by surfactants that give vulcanizates having superior cure characteristics and mechanical properties compared to mixes prepared by conventional mill mixing process.

SUMMARY OF THE PROCESS

The present finding relates to a process for preparing single or dual filler incorporated natural rubber master batch. The fillers used in the present invention are carbon black and silica. The individual filler dispersions are prepared and mixed with latex in presence of suitable surfactants. Then the latex-filler mixture is coagulated by the addition of acid to form coagulum. The coagulum is dewatered and dried to obtain filler incorporated natural rubber master batch. The mixed filler master batch is converted to a rubber compound by mixing with curatives and other necessary ingredients in a two- roll mill and processed further in the conventional method.

MAIN OBSERVATIONS

The mechanical properties of the vulcanizates obtained from the latex stage and dry rubber incorporated mixes are evaluated using conventional formulations. Mixed filler containing master batch prepared by the new process shows good cure characteristics as compared to the dry rubber incorporated mix. The mechanical properties like tensile strength, modulus, tear strength, abrasion resistance and hardness are superior for the vulcanizates prepared by the new method. The heat build – up values are considerably low for the latex filler master batches. The silica filled mixes show comparatively very good mechanical properties in the absence of any coupling agent. The improvement in mechanical properties shown by the silica/carbon black master batches over the conventional mill mixed compounds can be attributed to better filler dispersion and higher level of vulcanization.

CONCLUSION

A uniformly mixed filler dispersion and latex in presence of suitable surfactant coagulates quickly on addition of acids. The filler master batch prepared by this new method shows enhanced cure characteristic, filler dispersion and superior mechanical properties as compared to conventionally prepared mixes. This is a simpler and cheaper method of master batch preparation as compared to the earlier methods.