The other method employed to improve the dispersion of the aramid pulp in rubber is to use the pulp pre-blended into masterbatch by mixing the aramid pulp in polymer latex or other forms of polymers which are then incorporated in the formulation. Some compounders prefer these types since it shortens their mixing cycles and possible mixing time, but it adds cost of the raw material.

Another method reported in the prior art is the treatment of the aramid pulp with nanoparticles to ensure that the fibrils stay enlarged via the diffusion of the nanoparticles into the interstices of the fibrils. The nanoparticles could be in the form of silica, graphene, micronized pulp.

The mechanical method leads to non-uniform dispersion of the aramid pulp into the rubber. Other methods as mentioned above, aimed at minimizing the dispersion issues require additional step of preparing masterbatches and then incorporating them into rubber.

Thus, it is an object of the present invention to provide aramid pulp which can be incorporated directly into rubber and thus obviates the preparation of masterbatches. Another object is to provide aramid pulp which is evenly dispersed in the rubber matrix and enhances reinforcing of the rubber.

SUMMARY

Surprisingly, it has been found that coating the aramid pulp with a water-soluble cationic polymer is beneficial.

Thus, in one aspect, the present disclosure is directed to an aramid pulp comprising a plurality of fibrils, said fibrils having a coating of polyalkyleneimine disposed thereon.

In another aspect, the present disclosure relates to a method of coating the aramid pulp comprising a plurality of fibrils, said method comprising the steps of

(a) separating the plurality of fibrils to disentangle the fibrils;

(b) providing an aqueous solution of polyalkyleneimine;

(c) adding the aqueous solution of step (b) to the plurality of fibrils of step (a) and

(d) coating the plurality of fibrils with polyalkyleneimine to form coated aramid pulp.

In another aspect, the present disclosure relates to a rubber composition based on parts by weight per 100 parts by weight rubber (phr), comprising

(a) 1 to 25 phr of coated aramid pulp; and

(b) rubber;

wherein said fibrils are dispersed in said rubber.

In another aspect, the present disclosure relates to a method for preparing a rubber composition comprising the steps of

(i) providing the coated aramid pulp as defined above;

(ii) dispersing the coated fibrils of the aramid pulp of step (i) into rubber to form a rubber mixture;

(iii) combining the rubber mixture of step (ii) with at least one curative agent; and

(iv) curing the rubber mixture.

In another aspect, the present disclosure relates to the use of the rubber composition as defined above, in conveyor belts, power transmission belts, seals, gaskets, tires or stator pump components.

In still another aspect, the present disclosure relates to a conveyor belt, power transmission belt, seals, gaskets, tires or stator pump components comprising the rubber composition as defined above.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

Figure 1(a) is a Brightfield reflected polarized light microscope images of uncoated rubber of comparative example 1.

Figure 1(b) is a Brightfield reflected polarized light microscope images of rubber with aramid pulp coated with polyethyleneimine of example 7 at 50X magnification. A clump of aramid pulp not dispersed is visible in the case of Fig.1(a) whereas in the case of Fig. 1(b) the dispersion of aramid pulp in the rubber matrix is even.