

Use of Palm-Based Metallic Soaps as Processing Aids in Rubber Compounding

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Zinc and calcium soaps derived from various palm-based fatty acids were evaluated as processing aids in rubber compounding. The general term 'metallic soaps' is applied to salts of fatty acids with metals other than sodium or potassium. Chemically, they have some similarities with normal soaps but with the differences of being insoluble in water, and having high melting points and high lubricity.

The traditional raw material for metallic soaps has been hydrogenated tallow, which technically can be replaced with palm fatty acids. Palm fatty acids, however, have a high content of C16:0, instead of the C18:0 in tallow; this has led to the belief that the overall performance of the finished products would be affected.

In rubber processing, it is important to be able to control the level of viscosity of the compound prior to the actual manufacture of rubber products. There are basically four methods of reducing the viscosity of natural rubber, namely mastication, use of chemical

peptizers, use of fatty acid soaps, and use of a blend of fatty acid soap and chemical peptizer.

Fatty acid soaps reduce the viscosity of rubber by internally 'lubricating' the molecules without the need to alter the molecular make-up of the polymer. As a result, they are also known as physical peptizers.

The incorporation of palm-based soaps in rubber formulations helps reduce the overall energy requirement during processing, without affecting the physical properties of the resulting vulcanizates.

The suitability of these soaps as processing aids for natural rubber was shown by their effectiveness in reducing the viscosity, the mastication and mixing energy, and the extrusion stress of both unfilled and filled unvulcanized natural rubber compounds during extrusion, and in improving the surface smoothness of the extrudates.

The study shows that the use of palm-based metallic soaps does not have adverse effects on the properties of vulcanizates of typical carbon black-filled formulations. However, palm-based zinc soaps were observed to behave differently from palm-based calcium soaps.

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