FEASIBILITY OF MODIFIED STARCH AS BIO-FILLER IN NATURAL RUBBER COMPOUNDS

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In order to impart strength and reduce cost natural rubber (NR) is compounded with fillers of different types. In this work we have attempted to study the feasibility of using starch as a bio-filler in NR. Starch was incorporated into NR by directly mixing on a two roll mixing mill and also in the presence of a plasticizer to reduce the softening point of starch. Starch was also modified with resorcinol- formaldehyde resin and incorporated into NR in the latex stage which was then coagulated and dried to obtain a modified starch incorporated NR. The study showed that when NR was compounded with starch directly on a two roll mixing mill the properties were not improved. Natural rubber when compounded with starch in the presence of a plasticizer like ethylene glycol, the properties were slightly improved. Starch was modified with resorcinol-formaldehyde resin and was incorporated to NR in the latex stage, the properties were improved significantly. The compound containing 10 phr starch showed much better properties than the control. The study showed that starch can be used as a filler in NR to enhance its properties. Though carbon black cannot be fully replaced with starch, partial substitution is possible.

Keywords: Bio-filler, Carbon black, Filler, Latex, Natural rubber, Starch

In natural rubber, crosslinking introduced by vulcanization prevents the polymer chains from moving independently. As a result, when stress is applied, the vulcanized rubber deforms, but upon release of the stress it reverts to its original shape. Vulcanization is a chemical process for converting natural rubber or related polymers into more durable materials via the addition of sulphur or other equivalent curatives in thepresence of accelerators. These additives modify the polymer by forming crosslinks (bridges) between individual polymer chains preventing the chains from free movement. Vulcanized materials are less sticky and have superior mechanical properties (Lewis *et al*., 1937)

In order to impart strength and reduce cost in rubber products, natural rubber is compounded with fillers of different types. Some fillers are reinforcing while some others are inert fillers. Inert fillers are used to reduce the cost of the compound. The most commonly used filler in natural rubber is carbon black. Non-black fillers like silica, clay *etc.* are also used with natural rubber (Kaushik *et al*., 2010).

Carbon black is an indispensable filler for making tyre and most of the automobile

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