STUDIES ON CHARACTERIZATION OF ECO-FRIENDLY MATERIALS AND THEIR EFFECTS ON DIFFERENT PROPERTIES OF RUBBER COMPOUNDS

An

Abstract

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ABSTRACT

Sustainability is “Acting responsibly to meet the requirements of the present without compromising the ability of future generations to meet their own needs”. Sustainable development is basically use of renewable raw materials for all kinds of products manufacturing as and when possible. Its aim is to assure conservation of fauna and flora species. Because fossil reserves are decreasing, and greenhouse gas emissions are increasing regularly day by day. Carbon dioxide emissions can be minimized using these raw materials in products of daily use. It also helps in reduction of toxicity of products.

However, it is a quite challenging task to use sustainable materials in place of petroleum-based materials due to cost-performance compromise and lack of knowledge about structure property relationship for these materials. Few materials used by rubber industry are not sustainable like petroleum based raw materials

Huge quantity of extender oil is used by the tire industry, so it is getting attention. Several large oil manufacturing companies (traditionally blenders of refinery products) have already jumped on the foray as the demand of some of the naturally occurring vegetable oils are increasing and this trend is going to continue. These vegetable oils are non-carcinogenic, better processing and are shown to improve tire performance properties like rolling resistance, traction and mileage in varied proportions as compared to mineral oil counterpart.

In the present work styrene butadiene rubber latex (normal and high styrene content) was extended with various vegetable oils. Oil-extended rubbers prepared with normal styrene content latex were evaluated in American Society for Testing and Materials (ASTM) standard recipes and passenger car radial (PCR) tire tread compound formulation. Oil-extended rubbers prepared with high styrene content latex were evaluated in motorcycle tire tread compound formulation. Detailed characterization of the compounds was done with respect to processing, stress-strain, performance properties and dynamic mechanical properties.

Few vegetable oils based SBRs exhibited improvement in processing, performance and dynamic mechanical properties. These oils may be used for commercialization to produce sustainable SBRs. Few vegetable oils based SBRs exhibited slow cure behaviour in rheometeric characterization. These oils extended SBRs based rubber compounds may be evaluated with higher dosage of curatives to adjust the cure rate and crosslink density. Research work may also be conducted with use of blend of oils in place of using single oil for extension of SBR. This may further optimize the properties of the rubber compounds.

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