

ID-ICFAS2016: 1256

Blue mussel shell wastes as reinforcing filler in cold vulcanizing adhesives

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Abstract

Cold vulcanizing adhesives are used in a range of applications, including rubber-to-rubber bonds and rubber-to-metal bondings, as well as for cold splicing of fabric conveyor belts. The adhesives are composed of two separate components which are chloroprene based rubber cement and hardener. The rubber cement contains various accelerators, activators and fillers such as carbon black, silica, calcium carbonate, talc and clay. The fillers not only reduce the cost of the material but also improve the mechanical and curing properties of the adhesives. Silica is primary used as a reinforcing filler in the production of colored rubber products. For environmental protection, many researchers have studied the utilization of waste materials as fillers. The aim of this study is to obtain a cold vulcanizing adhesive with the incorporation of blue mussel shell waste in chloroprene rubber instead of conventional calcite and silica fillers. The chemical composition of the shells is about 90% calcium carbonate by weight; this composition is similar to calcite powder, which is used as filler in rubber industry to reduce cost of products. The physical and mechanical properties of the blue mussel shell filled adhesives were comparable with those of calcite and silica filled adhesives. Cure characteristics, which are scorch time (t_{s2}), cure time (t_{c90}), maximum torque (MH) and minimum torque (ML) of the rubber compounds were determined at 190°C with a Moving Die Rheometer to investigate the effects of the fillers on the curing behaviours of the rubber blends. Blue mussel shell filled chloroprene rubber blends showed superior vulcanization characteristics by

International Congress on Fundamental and Applied Sciences 2016

the increasing of cure rate index (CRI) with the reducing of cure time and scorch time. More importantly, incorporation of blue mussel shell wastes as filler provides substantial enhancement in the adhesion properties of cold vulcanizing adhesives.

Keywords : Blue mussel shell, Chloroprene rubber, Cold vulcanizing adhesive, Reinforcing filler

General area of research : Chemistry



International Congress on Fundamental and Applied Sciences

22-26 August 2016 Istanbul-Turkey

ICFAS2016

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icfas2016.yildiz.edu.tr

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