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Valorisation of Waste Chicken Feathers as Filler in Cold Vulcanizing Adhesives

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ABSTRACT

Feathers are generated in large quantities as a byproduct of commercial poultry processing. The feathers are considered wastes and different approaches have been used for disposing of the waste feathers, including landfilling and incineration. In recent years, some studies about the physical and morphological structure of the feathers indicate that feathers can be used as reinforcing materials for various applications. In this study, the usability of waste chicken feathers as filler in cold vulcanizing adhesives and its effect on the physical and mechanical properties of the adhesives were investigated. Experimental tests were performed to evaluate the possibility of using the waste chicken feathers as replacement of the conventional calcite powder in a formulation of cold vulcanizing cement. Rubber blends in presence of different fillers were prepared by using laboratory two-roll mill. Cure characteristics, which are scorch time, cure time and minimum torque of the rubber blends filled with the chicken feather and calcite were determined at 190°C with a Moving Die Rheometer. The influence of the chicken feather on the structure of the vulcanizate adhesive was investigated by Fourier transform infrared (FTIR) spectroscopy analysis. In addition, shear strength of the adhesives were investigated by tensile testing machine at three different adhesion times (4, 8 and 24 hours). The results indicated that the chicken feathers as filler provided a higher adhesive strength than calcite for cold vulcanizing adhesives in the 24 hours of adhesion. Low cost, large availability and unique properties can make feathers desirable filler for various rubber applications. The chicken feathers as a kind of byproduct materials not only lead to the discarding of valuable fillers but also cause environmental pollution.

Keywords: Chicken Feathers, Cold Vulcanizing Adhesive, Filler.