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Curing and Mechanical Properties of Waste Tyre Powder Filled EPDM Compounds

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Structured Abstract

Background: The global demand for rubber products, particularly tires, is continuously increasing. This escalating demand has led to a significant issue regarding the improper management of waste tires, with landfill disposal of waste tire products becoming a major contributor to various forms of pollution. This study aims to determine whether waste tire powder can serve as a replacement for carbon black as a filler in rubber products.

Methods: Waste tire powder is used as a filler in EPDM rubber products. The mechanical and physical properties of EPDM rubber are evaluated at different waste tire powder loadings (10 phr and 50 phr) and compared to EPDM without the powder. The curing characteristics are also analysed. FTIR is used to identify the functional groups in the waste tire powder, while SEM examines the tensile fracture surface of the rubber. The EPDM composites, containing waste tire powder, sulfur, zinc oxide (ZnO), stearic acid (SA), nonox CN, and CBS, are prepared using a two-roll mill. Their physical and mechanical properties are assessed through tensile testing, abrasion resistance, rebound resilience, swelling, and hardness tests.

Results: The results indicated that increasing the WTP content influenced the mechanical properties of EPDM. Tensile strength, modulus at 100% elongation, and elongation at break gradually increased with higher WTP loading, suggesting reduced elasticity and flexibility. Conversely, hardness exhibited an increasing trend, indicating enhanced rigidity with higher WTP content. FTIR analysis was used to identify the functional groups present in the WTP, while SEM was employed to examine the tensile fracture surface morphology of EPDM filled with WTP.

Conclusion: This study concluded that WTP content in EPDM rubber compounds can be effectively utilized as a partial filler. Incorporating WTP not only helps reduce waste tire pollution in landfills but also decreases the reliance on carbon black, offering a sustainable alternative for filler purposes in rubber applications.

Keywords: EPDM, Waste Tire Powder, Physical Properties, Recycling, Mechanical Properties

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