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# Investigation of Ageing Behaviour on EPDM Filled with Waste Tire Powder (WTP)

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**Structured Abstract**

**Background:** The increasing accumulation of waste tires poses significant environmental challenges, necessitating innovative recycling solutions to mitigate their impact. Ethylene Propylene Diene Monomer (EPDM) rubber, widely used for its exceptional weather resistance and mechanical properties, provides an ideal matrix for the incorporation of Waste Tire Powder (WTP). Utilizing WTP as a filler in EPDM rubber blends offers a sustainable approach to recycling waste tires while exploring its effect on the ageing behavior of the material.

**Methods:** EPDM-WTP blends were formulated with varying WTP concentrations (10%, 20%, and 30% by weight) to study the influence of filler content on ageing performance. The samples underwent accelerated ageing tests under controlled environmental conditions to simulate long-term exposure. Mechanical properties such as tensile strength, elongation at break, and hardness were analyzed both before and after ageing. Scanning Electron Microscopy (SEM) was used to examine the dispersion of WTP particles within the EPDM matrix and to assess morphological changes due to the ageing process.

**Results:** The results demonstrated that increasing WTP content altered the mechanical properties and ageing behavior of EPDM. Tensile strength and elongation at break showed a gradual decline with higher WTP content, indicating reduced elasticity and flexibility. In contrast, hardness improved slightly, suggesting enhanced rigidity. SEM analysis confirmed the uniform distribution of WTP particles in the EPDM matrix, with minor voids becoming evident at higher filler concentrations. Ageing tests further revealed that blends with lower WTP content retained superior mechanical properties compared to those with higher concentrations, highlighting the importance of optimal filler proportions.

**Conclusion**: This study concludes that WTP can be effectively utilized as a partial filler for EPDM rubber, presenting an eco-friendly recycling strategy for waste tires. However, maintaining a balanced filler proportion is critical to ensure optimal mechanical performance and ageing resistance. Future research could focus on surface treatment methods to improve the compatibility between WTP and EPDM for enhanced material performance.

**Keywords:** EPDM, Waste Tire Powder, Ageing Behavior, Recycling, Mechanical Properties

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