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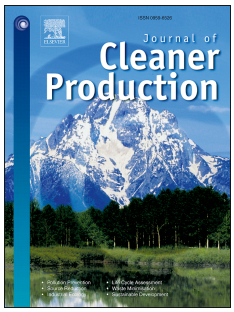

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Production of A Sustainable Paving Material through Chemical Recycling of Waste PET into Crumb Rubber Modified Asphalt

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Abstract

Plastic materials such as polyethylene terephthalate (PET) are extensively used in manufacturing drinking bottles, food packaging and many other forms of plastic products. However, the inappropriate disposal of large amount of PET waste may cause severe environmental problems. Using PET derived products as a performance-enhancing additive for asphalt can be one of the alternatives to recycle and reuse this waste material. Similarly, disposal of waste vehicle tyres is also a challenging environmental problem. Research has shown that the use of crumb rubber (CR) from waste tyres in asphalt helps improve some of its rheological properties but is often plagued with other concerns such as low storage stability. The main objective of this study is to investigate the feasibility of using the waste PET additives, derived through an aminolysis process, to improve the storage stability and rheological performance of crumb rubber modified asphalt (CRMA). Both the storage stability, and rheological and chemical properties of the asphalt binders collectively modified with PET additives and CR were investigated. It was found that the incorporation of PET based additives to CRMA improved the storage stability, rutting and fatigue resistances, and increased the rotational viscosity (RV) of the modified binders. Overall, the results indicated that the collective usage of waste PET derived additives and scrap tyre rubber in asphalt not only helps recycle waste plastic and rubber, but also improves the engineering properties of asphalt pavement.

Keywords: Waste PET; Crumb Rubber; Recycling; Modified Asphalt; Sustainable Paving