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Durability of Stone Mastic Asphalt Mixture with the Amalgamation of Bamboo Fibres as a Binder Modifier

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Abstract

Pavement, typically made of asphalt or concrete, provides a durable and smooth surface for vehicle travel, essential for roads, highways, driveways, and parking lots. In Malaysia, unpredictable weather and heavy vehicle traffic contribute to pavement deterioration, leading to uncomfortable and unsafe driving conditions. This study explores the impact of incorporating bamboo fibres, an indigenous material, as a binder modifier on the durability of the Stone Mastic Asphalt (SMA) mixture. SMA is known for its superior rutting resistance, durability, and ability to withstand heavy traffic loads, making it an ideal choice for high-performance road surfaces. The research includes comparative analysis and laboratory experiments on bamboo fibre-modified SMA mixtures with conventional asphalt mixtures. Key tests include Sieve Analysis, Los Angeles Abrasion Value, Aggregate Crushing

Value, Penetration, Softening Point, Marshall Stability, and Cantabro. Experiments were performed using PEN 60/70 bitumen grade with bamboo fibre additions at 0, 0.5, 1.0, and 1.5% by weight of the bitumen. Results indicate the potential for bamboo fibres to enhance asphalt pavement durability, providing a sustainable solution for road infrastructure. © The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2025.

Author keywords

Abrasion; Bamboo fibres; Durability; Modified binder; Stone mastic asphalt (SMA)

Indexed keywords

Engineering controlled terms

Asphalt pavements; Bamboo; Binders; Deterioration; Fibers

Engineering uncontrolled terms

Bamboo fibres; Heavy vehicle traffic; Malaysia; Modified binders; Parking lots; Pavement deterioration; Smooth surface; Stone mastic asphalt; Stone mastic asphalts; Vehicle travels

Engineering main heading

Abrasion; Durability; Mastic asphalt

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