

Mechanical properties of stone mastic asphalt incorporating nano titanium modified asphalt binder

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ABSTRACT

Due to its rough surface texture, Stone Mastic Asphalt (SMA) can create great qualities, such as good skid resistance and better visibility during rainy days, as well as optimal light reflection. The service life of SMA, on the other hand, reduces owing to a rapid increase in traffic loads, heavy traffic, and environmental conditions. TiO₂'s stable qualities and optimal content can help to improve the performance of modified asphalt at a reasonable cost and with low filler content. This study explores the effect of nano titanium on the performance of stone mastic asphalt. Virgin bitumen is modified with 2% and 4% of nano titanium by bitumen weight. The physical properties of the bitumen are accessed by carrying tests such as penetration tests, softening points, and ductility. The results show that the modified bitumen samples of 2% Nano-TiO₂ powder content for bituminous tests have enhanced hardness, consistency, and ductility. While for the performance tests for the SMA samples are abrasion, Marshall stability, resilient modulus, and dynamic creep. Overall, 2% Nano-TiO₂ powder content has been determined for the optimum content and best performance, where it provides high stability, strength and enhances stiffness effectiveness, which can improve SMA performance. However, the findings show lack of awareness and research is a factor that does not receive special consideration from the industry or the government. Therefore, the sharing of ideas and technology for each continuous research is needed to improve construction quality.

KEYWORDS

Stone mastic asphalt; Nano titanium oxide; Stability; Resilient modulus; Dynamic creep

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