Mechanical performance of asphalt mixture containing nano-charcoal coconut shell ash

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A B S T R A C T

Rutting and fatigue cracking are issues in pavement engineering that led to numerous studies for improv-ing pavement performance. Bitumen modification by nanomaterials is a method that can enhance the performance of asphalt mixtures due to the large surface area and small size (1–100 nm) of nanomate-rials. Therefore, this research was focused on the influence of nano-charcoal coconut shell ash (NCA)-modified bitumen towards the engineering properties of asphalt mixtures. Engineering property tests were carried out on 0% (control), 1.5%, 6% and 7.5% NCA asphalt mixtures. These tests include Marshall analysis, indirect tensile strength (ITS), resilient modulus and dynamic creep test. The microstructure properties of the asphalt mixtures were evaluated using Atomic force microscopy (AFM) and field emis-sion scanning electron microscopy (FESEM). Results showed that the Marshall stability, ITS, resilient modulus and dynamic creep of the asphalt mixture were significantly improved with the addition of 6% NCA. AFM results showed that 6% NCA has the lowest surface roughness which improved the adhesion of asphalt mixture. Flat and dense asphalt mixture was observed from FESEM which contributed to the enhancement of asphalt mixture engineering performance.

Keywords:
Nano; Charcoal ash; Coconut shell; Asphalt mixture; Engineering properties