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Abstract

Mechanical Performance of Bio-Based Modification of Asphalt Concrete Mix: A Study for Eco-Friendly Sustainable Development in Developing Countries †

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Abstract: Bio-based modification of bitumen can be used to replace the stiffening effect of asphalt pavement. It can help to improve the efficiency of the asphalt projects for sustainable development. The eco-friendly utilization of waste materials also helps in the maintenance of a desirable, clean environment. In this study, different percentages of bio-based waste cooking oil (WCO) have been used for the modification of bitumen. Asphalt concrete mix can help to develop a sustainable infrastructure using waste materials. Marshal stability analysis methodology was used to analyse the performance of modified asphalt concrete mixtures. The various characteristics of the modified asphalt mixtures were analysed to determine the performance of modified asphalt. The results of the study revealed that the recycling process of waste bio-based oil maintained the performance of the asphalt mixtures compared to the control ones. Marshal Stability Analysis showed that stability value, with the modification of 2% WCO in Bitumen, increased from 29.363 to 31.855 but even at 6% the modification value remained within an acceptable limit. Flow values also remained within the range, i.e., (2–4). Overall, strength and performance evaluation showed a successful production of asphalt concrete mix using proposed waste materials at a local level. This study will aid in the eco-friendly sustainable development of road infrastructures and sustainable cities in developing countries.

Keywords: sustainability; eco-friendly; asphalt mix; infrastructure

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