Prediction of HMA mixture performance from rheological and rutting evaluation of nanopolymer asphalt binder

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ABSTRACT

Recently, the interest among researchers in nanopolymers used in modified binders has increased in order to achieve high performance of the bituminous mixture. This work presents a study on HMA with different nanopolymer proportions and different mix gradation types conducted to evaluate the rheological performance of asphalt binder and HMA mixtures. The design method of the Marshall mix was used to achieve an optimal asphalt binder content with a different proportion of nanopolymer polymer modificers. The resilient modulus test was conducted to measure the stiffness of the HMA mixtures, while the dynamic shear rheometer test with a short-term aging technique was used to evaluate the rutting of the asphalt binder. The regression analysis was used to test the performance of the nanopolymer rheological asphalt binder and HMA asphalt mixture. Empirical and predicted data from experimental research have been used to construct and validate regression models. The rheological asphalt binder has been shown to have a significant effect on the performance of the HMA asphalt mixture. This result has shown that the finding provides guidance for predicting the performance of HMA asphalt mixtures with respect to the performance of the rutting asphalt binder and, as a result, nanopolymer can be used as an asphalt modifier in road construction.

KEYWORDS

Nanopolymer; Asphalt binder; Rheological properties; Hot mix asphalt; Rutting; Resilient modulus

ACKNOWLEDGEMENTS

Special thanks to the Research Management Institute (RMI) of Universiti Teknologi MARA for providing the financial support (600-IRMI/FRGS 5/3 (379/2019). The authors would like to thank the Faculty of Civil Engineering, Universiti Teknologi MARA Malaysia for providing the experimental facilities and to all technicians at Highway and Traffic Engineering Laboratory.