

PERFORMANCE PROPERTIES OF FAST PYROLYSIS BIO-OILS MODIFIED ASPHALT

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ABSTRACT

Most asphalt binders are derived mainly from fossil fuels via crude petroleum. Due to the availability of bio-renewable resources, there are technical and economic opportunities in utilizing them to produce bio-binders for partial and/or full replacement of crude petroleum derived asphalt. Currently, there are research efforts investigating the applicability of using bio-oils as a bitumen modifier (3% to 9% replacement), and as a bio-binder (100% replacement). Based on previous investigations, the utilization of bio-oils as a bitumen modifier or a bio-binder is very promising. The main objective of this study is to determine the effect of replacement the asphalt with different types of fast pyrolysis bio-oils (oakwood and switchgrass) on the performance properties. Performance properties include the high, intermediate and low temperature performance grades and the mixing and compaction temperatures. The results revealed that the high and intermediate temperature performance grades of the fast pyrolysis bio-oils modified asphalt were not affected, while the low temperature performance grades were adversely affected by almost six degrees Celsius. In addition, the mixing and compaction temperatures of the fast pyrolysis modified asphalt were decreased by about 20°C. As an overall conclusion, the replacement of asphalt with different types of fast pyrolysis bio-oils is applicable and feasible but care and caution should be considered.

KEY WORDS: Bio-oils, Bio-asphalt, Modified asphalt, Performance properties, Modified Bitumen