

CONCEPTUAL PHENOMENOLOGICAL MODEL FOR INTERACTION OF ASPHALT BINDERS WITH MINERAL FILLERS

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ABSTRACT

Many studies focused on modeling the stiffening effect of filler on asphalt binder. However, the interaction between both constituents was always a challenge to address and include in such efforts. In this study, the authors provide a conceptual model for understanding the mechanism by which the filler stiffens the asphalt mastic. The model hypothesizes that the mastic complex stiffness follows two phases depending on the volume concentration of the filler; a diluted phase and a concentrated phase. This model is capable of determining the influence of the filler in a quantitative manner using new measurements of cohesive strength. The tackiness (cohesion) of the mastic is used as a measure to determine the volume fraction of influenced asphalt. Examining 5 different fillers mixed with one asphalt binder, the conceptual model is validated. The volume fraction of the influenced asphalt shows strong correlation with the filler interaction indicator provided by the conceptual model. In this study the concept of fractional voids using the Rigden test is shown to provide good correlation with the average filler particle size as well as the stiffening rate of fillers, but only within the diluted region. However, within the concentrated region it was incapable of predicting the interaction of the filler with the asphalt binder.

KEY WORDS: Mineral Filler, Mastic, Cohesion, Modeling

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