

The influence of filler type and gradation on the rheological performance of mastics

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Mastic is the main component that undergoes any deformations in asphalt structure. Low shear resistance can lead to susceptibility to permanent deformations. Mastic performance can be highly improved by fillers. This paper describes the influence of filler type and gradation on the rheological performance of mastics. The main aim of the study was to evaluate different types of mineral fillers and their stiffening effect on unmodified and modified mastics in terms of permanent deformations. During this study performance of three mineral fillers, namely Jelsa granite, Portland cement and limestone are investigated. Also three mixed filler mastics with different ratios have been prepared for the performance assessment. The fillers used in this study were evaluated according to common filler characteristics: Rigden air voids (RV), density, Specific Surface Area (SSA), Fineness modulus (FM), Coefficient of uniformity (Cu) and Coefficient of curvature (Cc). Dynamic shear rheometer (DSR) was used for testing mastics under repeated shear stress with multiple stress creep recovery (MSCRT). Fine gradation, as it was observed with limestone filler, and high fractional voids can result in high stiffening effect, therefore high resistance to permanent deformations. Analysis of the results showed that limestone provides the best stiffening effect, due to its fine gradation, high percentage of fractional voids and high specific surface value, resulting in high amount of bitumen being fixed in place. Granite filler showed poorer performance in terms of rutting resistance.

Keywords: filler, bitumen, mastic, dynamic shear rheometer, multiple stress creep recovery test