Workability Evaluation of Rubberized Asphalt
from a Perspective of Particle Effect

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Introduction

One of the main obstacles for applying asphalt rubber (AR) is its poor workability.

Rotational viscosity test is not quite reliable for rubberized asphalt binder due to the particle effect of insoluble crumb rubber.

This research aims to contribute to the AR workability research by exploring the effects of CRM content and particle effect.

Schematic of AR's rotational viscosity compositions

Materials and Methods

Type X Base binder
X=1: Pen 60/80
X=2: Pen80/100
Y=5, 8, 10, 15, 20, 25

177 ℃
60 min mixing

AR binder

Liquid phase of AR (LAR)

AR binder

Rotational Viscosity: AR & LAR

Rotational viscosity of AR1s and AR2s

Rotational viscosity of LAR1s and LAR2s

Correlation: SGC Number & Rotational Viscosity

Correlation between ARs, LARs viscosity and SGC number

There is a threshold for the CRM content. Below this threshold, increasing the CRM content can enhance the CRM/base liquid interactions, above this threshold, CRM/base binder interactions are not significantly affected by the CRM content. This finding is supported by the GPC test results.

Contributions to AR Viscosity:
CRM/Base Binder Interactions & Particle Effect

Regardless of temperature and binder type, a higher CRM content results in a higher CP and a lower CR revealing the enhancement effect of CRM content on the CRM particle effect.

Correlation: SGC Number & Rotational Viscosity

As is indicated in four graphs above, the correlation between SGC number and LAR viscosity is better than that of SGC number and AR viscosity. It is recommended to use the liquid phase viscosity at 135 ℃ to predicate the workability of the corresponding asphalt mixture.

Conclusions

For AR binder, rotational viscosity value is influenced by both the viscosity of liquid phase and the particle effect of CRM.

There are thresholds in terms of crumb rubber content. Once the content exceeding them, only particle effect contributes to the viscosity.

Compare to the AR viscosity, the viscosity of corresponding liquid phase might be a more reliable parameter to indicate the workability of asphalt.

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