

Accepted Manuscript

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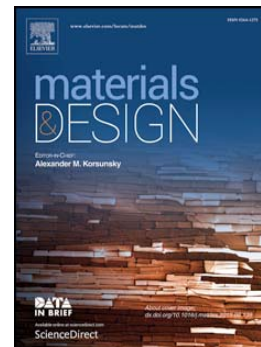
PII: S0264-1275(16)31029-2
DOI: doi: [10.1016/j.matdes.2016.07.124](https://doi.org/10.1016/j.matdes.2016.07.124)
Reference: JMADE 2128

To appear in:

Received date: 11 April 2016
Revised date: 24 June 2016
Accepted date: 25 July 2016

Please cite this article as: Salvatore Mangiafico, Hervé Di Benedetto, Cédric Sauzéat, François Olard, Simon Pouget, Luc Planque, Effect of colloidal structure of bituminous binder blends on linear viscoelastic behaviour of mixtures containing Reclaimed Asphalt Pavement, (2016), doi: [10.1016/j.matdes.2016.07.124](https://doi.org/10.1016/j.matdes.2016.07.124)

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Effect of colloidal structure of bituminous binder blends on linear viscoelastic behaviour of mixtures containing Reclaimed Asphalt Pavement

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Abstract

Hypotheses

The influence of binder properties on rheological behaviour of mixtures (produced with different contents of Reclaimed Asphalt Pavement and base binders) was investigated. Bitumen is responsible of the viscoelastic nature of mixture behaviour. Therefore, if mechanical properties of bituminous binders depend on their chemical composition and colloidal structure, then proportions of colloidal fractions of binders are expected to be related to linear viscoelastic modelling of mixtures.

Experiments

Complex modulus tests results obtained on mixtures were fitted with analogical 2S2P1D (2 Springs, 2 Parabolic elements, 1 Dashpot) LVE model. Classical semi-empirical tests were performed on corresponding binders (pure and blends), while their colloidal structure was investigated by performing SARA (Saturates, Aromatics, Resins, Asphaltenes) fractioning. Correlations were observed between 2S2P1D parameters of mixtures and binder test results.

Findings

2S2P1D parameters of mixtures showed to be related to results of semi-empirical tests and SARA fractioning of corresponding binders. In particular, mixture parameters k and h and τ_0 (at 15°C) show successful correlations with asphaltene content and Colloidal Index of binders, as well as to penetration (at 25°C), softening point and Fraass breaking point.

(178 words excluding subheadings)

Keywords: bituminous mixtures; binder blends; colloidal structure; LVE behaviour; 2S2P1D model; SARA

Highlights

- Complex linear viscoelastic behaviour of all tested bituminous mixtures was correctly modelled using 2S2P1D (2 Springs, 2 Parabolic elements, 1 Dashpot) model.
- Constants of 2S2P1D model correlated with results of semi-empirical tests and colloidal structure of corresponding binders.

1 Introduction

Economic and environmental reasons have made the use of Reclaimed Asphalt Pavement (RAP) in bituminous mixtures a widespread practice in road industry. Recycling rate has constantly grown in the last

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