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Polymer modified bitumen: Rheological properties and structural characterization

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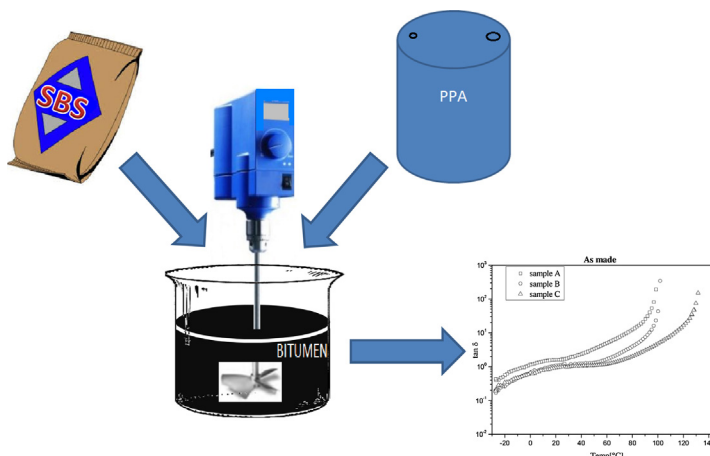
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HIGHLIGHTS

- We investigate the effects of SBS polymer and PPA on the structure of the bitumen.
- We examine changes in structures of the bitumen at different aging steps.
- ILT analysis of the NMR echo is one of the most powerful tools for the bitumen structure characterization.

GRAPHICAL ABSTRACT



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ABSTRACT

Polymer modified bitumen (PMB) is used extensively in thin asphalt surfacing and seals in order to improve specific performances. However, the performances of PMB are not easy to demonstrate with the conventional methods, such as penetration test, softening point etc. In order to a better evaluation, different characterization methods are needed rather than ordinary empirical rheological tests. This work deals with the characterization of linear copolymer styrene–butadiene–styrene (SBS) and SBS + polyphosphoric acid (PPA) modified bitumen by using conventional as well as advanced methods on bitumens at different ageing steps and temperature. Fundamental rheological tests, based on a state of the art dynamic shear rheometer in the temperature range from $-30\text{ }^\circ\text{C}$ to $+160\text{ }^\circ\text{C}$ and advanced ^1H magnetic resonance relaxometry analysis to evaluate the effect of modifiers on the bitumen structure, were used. Moreover, morphological analysis by scanning electron microscope (SEM) was performed on neat and modified bitumen and the effect of the filler addition on the supra-molecular organization of the bituminous binder was also investigated.

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