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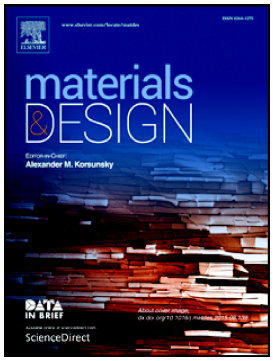

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On the investigation of self-healing behavior of bitumen and its influencing factors

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ABSTRACT

Bitumen, which combines individual aggregate particles, is crucial in the self-healing of asphalt materials. However, the underlying mechanism and influencing factors of self-healing remain ambiguous. In this study, the effects of different factors were investigated using a multi-failure-healing cycle test based on the Binder Bond Strength (BBS) test. Then, Computed Tomography scan (CT-scan) test was performed to visually confirm the results of the BBS test. Results indicate that bond strength recovery displays various patterns over time under different conditions. What is unexpected is that the water exerts multiple effects on the healing potential of bitumen, although it negatively influences the healing capability of this material over time. In addition, the healing capability of bitumen continuously increases with healing temperature. The result of CT-scan test further confirms this phenomenon and indicates that healing temperature is more important than healing time. As for the aging process, it elicits different effects on the base bitumen and modified binder. Both the BBS test and CT-scan test show the negative effect of Styrene–Butadiene–Styrene (SBS) modifier on the healing potential of the base bitumen. Moreover, CT-scanned images reveal that three healing stages can be suggested to interpret the healing behavior: gathering, moving, and rounding.

Keywords: self-healing; bitumen; influencing factors; modifiers; mechanism.

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