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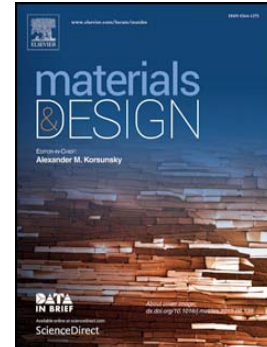
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Effective mechanical properties of self-healing cement matrices with microcapsules

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Abstract: The effective mechanical properties of matrices healed by embedded microcapsules were investigated using Eshelby theory based on the microscale healing mechanisms, referring to the mechanical properties of the adhesive and the proportion of cracks that could be healed. This was determined by measuring the water absorption and vacuum saturation of precracked matrices. The microcapsules or cracks should not exceed 4 vol% to ensure that approx. 90% of the modulus is retained even if the cracks cannot be reattached at all. Both the healed cracks and unhealed cracks contribute to the anisotropy, with a greater contribution from the unhealed cracks. The elastic modulus of the adhesive has a more significant influence on the anisotropy as the applied load increases. The measured stiffness recovery indicates that the cracks were only partially healed. This value corresponds to a healing efficiency index of 0.2~0.4 for the present conditions.

Keywords: self-healing; microcapsule; effective mechanical properties; cement-based

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