Cement and Concrete Composites
Volume 139, May 2023, 105045

Synergistic effect of fibres on the physical, mechanical, and microstructural properties of aerogel-based thermal insulating renders

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Abstract

There is an increasing demand for highly efficient thermal insulating materials in buildings. This study presents a novel solution incorporating nanomaterials, such as silica aerogel, which can achieve low thermal conductivity values (below 0.030$Wm^{-1}K^{-1}$) in renders. A key challenge of using aerogels is their low mechanical strength and high capillary water absorption. Here we describe a novel approach employing fibres which mitigates against some key properties which are decreased as a consequence of using aerogel. The incorporation of aramid (0.50%), sisal (0.10%), and biomass (0.10%) fibres (by total volume) was evaluated experimentally in terms of physical, mechanical, and microstructural properties. A synergistic effect between the fibres and aerogel increased