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Fresh and mechanical properties, and strain sensing of nanomodified cement mortars: the effects of MWCNT aspect ratio, density and functionalization

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Abstract

Keywords: Mortars; carbon nanotubes; functionalization; bulk density; aspect ratio; flexural strength, stiffness; toughness; strain sensing

Abstract

A comprehensive analysis on the effect of aspect ratio, bulk density and functionalization of multi walled carbon nanotubes (MWCNTs) in the development of nanomodified mortars, reinforced with different types of MWCNTs is presented herein. A structural characterization of the pristine and functionalized carbon nanotubes was carried out with scanning electron microscopy (SEM), transmission electron microscopy (TEM), and thermogravimetric analysis (TGA). A simple one step dispersion method, involving the application of ultrasonic energy and the use of a superplasticizer (SP) was utilized for the preparation of uniformly dispersed MWCNT suspensions. The experimental determination of the fresh and 28d mechanical properties of mortars with w/c=0.5 and s/c=3.0, using four different types of well dispersed pristine and functionalized MWCNTs at an amount of 0.1 wt% of cement took place through: (i) flow and time of setting tests; (ii) three point bending experiments on 4x4x16cm specimens; and (iii) uniaxial compression on the half prisms of the

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