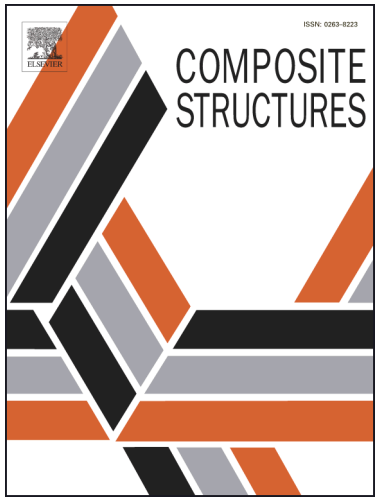

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Fabrication and design of electromagnetic wave absorber composed of carbon nanotube-incorporated cement composites

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Abstract

In the present study, an electromagnetic (EM) wave absorber was fabricated with a multi-walled carbon nanotube (MWNT)-incorporated cement composite and the absorbing capability of the absorber was assessed. To disperse MWNTs in a cement matrix, composites were fabricated under a low flow condition of the fresh mixture, and silica fume (SF) was added to explore the influence of SF addition on MWNT distribution. The electrical conductivity of the composite was evaluated to examine the MWNT distribution and the complex permittivity was determined to study the EM characteristics of the composite. The conductivity results demonstrated that SF addition of 10 wt.% led to the greatest enhancement. Meanwhile, the absorber was designed on the basis of complex permittivity at a frequency point of 9.4 GHz, and SF0-M1.0 type (no SF addition and MWNT content of 1.0 wt.%) and SF10-M0.6 type (SF content of 10 wt.% and MWNT content of 0.6 wt.%) were employed. The experimental assessment of the absorbing capability demonstrated that the - 10 dB bandwidths of SF0-M1.0 and SF10-M0.6 type absorbers were 2.5 GHz and 3.2 GHz, respectively. In addition, the absorbing capability derived from the experimental work was compared and validated by means of computational simulation work.

Keywords: Electromagnetic wave absorber, Cement composite, Carbon nanotube, Percolation threshold, Electrical conductivity

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