Effect of Graphene Oxide Nanoparticles on the Electromagnetic Shielding Capability of Engineered Cementitious Composites

Valeria Corinaldesi

Department of Science and Engineering of Matter, Environment and Urban Planning, Università Politecnica delle Marche, Ancona, Italy

Jacopo Donnini

Department of Science and Engineering of Matter, Environment and Urban Planning, Università Politecnica delle Marche, Ancona, Italy

Alida Mazzoli

Department of Science and Engineering of Matter, Environment and Urban Planning, Università Politecnica delle Marche, Ancona, Italy

Abstract:

Electromagnetic shielding and propagation in concrete structures are getting more and more interest in radiation hazard problems and wireless communications. The protection of sensitive environment is nowadays carried out by appropriate shielding room made of metallic walls. Their efficacy is counteracted by their heaviness, not adequate for the installation over existing building walls. The using of concrete composites filled by conductive elements such as carbon-based nanoparticles represents a valid alternative to metallic shielded room since they can be adopted to directly build up the building walls and/or to easily plaster existing walls. Graphene oxide powder (nanometer in its thickness, with particle size between 500 and 800 nm in diameter), carbon nanotubes (which are filaments with section diameter in the range 10–100 nm and length up to 10 μm) and metallic fibers are being currently investigated as fillers in the manufacturing of electromagnetic shielding cementitious composites. The novelty of the present work is the characterization of a multi-reinforced cement realized by combining two filler typologies: the synergistic effects of graphene oxide nanoparticles and short steel fibers result in enhancement of both mechanical properties and electromagnetic interference effectiveness of the engineered cementitious composites.

Keywords:

Graphene oxide, Carbon-based Nanoparticles, Electromagnetic Shielding, Shielding effectiveness, Engineered Cementitious Composites.