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NANOTECHNOLOGY: CEMENTITIOUS NANOCOMPOSITES AND RESTORATION MATERIALS

Styliani Papatzani

[1]Hellenic ministry of culture and sports, Directorate of restoration of medieval and post-medieval Monuments, Greece
[2]University of Brighton, England

Nanotechnology continuously reshapes our world, redefines and enriches knowledge, while opening new horizons. Tailored construction materials have become a reality and characterization techniques relating to all scales (nano-micro-macro) are being correlated. But what can nanotechnology offer in cement science and how can we best utilize the available resources and expand them? This talk provides an overview of the speaker's latest achievements in the field of cement science with the addition of specific nanoparticles. Silicon dioxide and montmorillonite nanoparticles are scrutinized, new theories and methodologies on how the dispersion medium and nanostructure of the particles can affect the performance and characteristics of composite cement formulations are discussed. In light of the E U regulations on limiting the CO_2 emissions mainly caused by the production of Portland cement clinker (PC), the research carried out breaks the allowable minimum limits of PC addition in composite cement formulations. The permissible maximum limits of additions such as fly ash, limestone and/or silica fume according to EN 197-1:2011 are also broken by adding nanoparticles. This breakthrough is allowing a twofold advantage in embodied CO_2 emissions reduction and further financial savings. Denser microstructure, stronger and more durable cementitious products are rendered possible. How can we best monitor these changes? Of the various characterization techniques available, which can be directly correlated? On top of all, what are the levels of confidence with respect to the nanoparticles addition? Which are the controlling parameters and how can we ascertain the benefit? In addition, could specific nanoparticles be suitable for the structural restoration of historical listed monuments? All the above questions will be answered through selected series of comparative results showing the enhancements offered by the addition of the nanoparticles and the difficulties encountered. The talk will be concluded with ideas on further research

Biography

Styliani Papatzani has completed three Master courses [Imperial College and National Technical University of Athens (NTUA)] with awards and distinctions. She has worked in industry carrying out structural design of new buildings and structural assessments of existing buildings and monuments, then completed a PhD on the effect of various nanoparticles in cement formulations from the University of Bath, UK and Postdoctoral studies at the NTUA. She is currently a Senior Engineer at the Hellenic Ministry of Culture, Greece and a Lecturer at the University of Brighton, UK. She has published more than 25 papers in reputed journals, book chapters and conferences and has been serving as a Consultant and Technical Expert in a number of professional committees.

spapatzani@culture.gr
spapatzani@gmail.com