Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)
ISSN 1673-565X (Print); ISSN 1862-1775 (Online)
www.jzus.zju.edu.cn; www.springerlink.com
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Book review:

Nanotechnology in Eco-efficient Construction: Materials, Processes and Applications, 2nd Edition

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https://doi.org/10.1631/jzus.A19BR002

F. PACHECO-TORGAL, M.V. DIAMANTI, A. NAZARI, C.G. GRANQVIST, A. PRUNA, S. AMIRKHANIAN (Eds.), 2018. Nanotechnology in Eco-efficient Construction: Materials, Processes and Applications, 2nd Edition. Woodhead Publishing, UK.
eBook ISBN: 978-0-08-102642-7
Paperback ISBN: 978-0-08-102641-0

The construction industry is facing a big challenge in reducing the burden it is putting on the environment. There is an urgent need to develop and use eco-efficient construction materials with proper functional performance, a low carbon footprint and a less adverse impact on the environment. Nanotechnology is a new and very promising technology that helps fulfil the need for more environmentally friendly construction materials.

The book "Nanotechnology in Eco-efficient Construction: Materials, Processes and Applications" edited by F. PACHECO-TORGAL, M.V. DIAMANTI, A. NAZARI, C.G. GRANQVIST, A. PRUNA, and S. AMIRKHANIAN came to my attention as one of the most up-to-date reviews and summaries of state-of-the-art work on the use of nanotechnology in modern construction. The editors are well-known as researchers at the forefront of this important field. In particular, lead editor Fernando PACHECO-TORGAL, a prominent researcher from Centre for Territory, Environment and Construction Research Centre, Minho University, Portugal is the top researcher in construction materials, including green, eco, and nano materials. He has edited and compiled 18 international books and has reviewed more than 750 papers for 125 international journals making him one of the world's top reviewers (among the top 0.1% of more than 500 000 reviewers registered in Publons). Maria V. DIAMANTI from the Department of Chemistry, Materials and Chemical Engineering, Politecnico di Milano, Italy is a well-known expert in materials engineering, nanotechnology, and nanomaterials. Ali NAZARI from Swinburne University of Technology, Melbourne, Australia has expertise in civil engineering and is another familiar name and excels in construction materials, 3D printing, and nano-cementitious composites. Claes G. GRANQVIST from Chalmers University of Technology, Sweden excels in a number of areas including green nanotechnology, materials for energy efficiency, electrochromic materials, and nanoparticles. Alina PRUNA from the Polytechnic University of Bucharest, Romania adds to the book her expertise on nanomaterials, nanotechnology, and material characterization. Serji AMIRKHANIAN from the Center for Sustainable Infrastructure Civil, Construction and Environmental Engineering, College of Engineering, University of Alabama, USA completes the book with his expertise on the utilization of nanomaterials in asphalt and pavement engineering.

In this, the second edition of this book, the application of nanotechnology in construction is demonstrated with examples of state-of-the-art research in each area. Part 1 deals with the application of nanotechnology to mortars and concrete. The effects of various nanoparticles and supplementary cementitious materials on the mechanical properties of ultra-high performance concrete (UHPC) are given with emphasis on the dispersion and distribution of

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nanomaterial and techniques for better homogenization of nanoparticles. In Chapter 3, the self-healing properties of high performance concrete incorporating nanomaterials are highlighted. This is followed by the use of the fairly new nanomaterial "graphene oxide" in cementitious systems. The book also describes the use of nanomaterials in new "alkali-activated binders". Part 1 concludes with a good review of experimental work on the use of nanoindentation for evaluation of the properties of cement and fly ash binder systems.

Part 2 covers the application of nanotechnology to pavements and other infrastructure materials. The improvement of asphalt by mixing with nanoparticles and a method for dispersing nanomaterials in the asphalt binder are described. The emphasis on graphene oxide modified asphalt is also addressed. Chapter 11 gives a comprehensive review of recent progress in the use of nanocomposites in structural health monitoring. This is followed by the use of nanocarbon black (NCB) and conductive fibers for self-monitoring of strain and cracking after flexure. The subjects of icephobic nanocoatings, anti-corrosion coatings for structural protection, and fire retardant nanocoatings for wood protection are reviewed and summarized in a commendable way.

Part 3 concentrates on applications for building energy efficiency. Chapter 17 reviews the current state-of-the-art of aerogel-enhanced systems. The next chapters review the application of aerogel windows and glazing units in buildings, aerogel-enhanced insulation for building applications, advanced glazing technologies, smart perovskite-based technologies, electrochromic glazing, and VO_2-based thermochromic materials (flexible foils and coated glass). As indicated by the European Cement Association (2013), the development of innovative buildings to provide energy efficient housing solutions is essential, and so the importance of this section is clear.

Part 4 covers photocatalytic applications, which are important for various aspects of the current and future uses of functional materials. This section includes photocatalytic mortar, photocatalytic coating, self-cleaning efficiency of nanoparticles applied to facade bricks, nanotreatments to inhibit microalgal fouling, self-cleaning cool paints, and photocatalytic water treatment.

Part 5 covers toxicity, safe handling, and environmental impacts. The toxicity of nanoparticles, control of occupational exposure to nanoparticles in construction, measurement of exposure to nanomaterials, and life-cycle assessment are reviewed. This is probably the most important section for the proper utilization and sustainable progress of nanotechnology in the construction field.

This book, with 31 chapters and 876 pages, provides a large amount of extremely useful information about research and applications for those in the eco-construction field. The large collection of references from this diverse field is another strong point of this book.

Reference

European Cement Association, 2013. The Role of Cement in the 2050 Low Carbon Economy. https://cembureau.eu/media/1500/cembureau_2050roadmap_lowcarboneconomy_2013-09-01.pdf