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Durable Concrete for Infrastructure under Severe Conditions

Smart Admixtures, Self-responsiveness and Nano-additions

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Editors

Maria Adelaide Araújo, Ghent University

Nele De Belie, Ghent University

Kim Van Tittelboom, Ghent University

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Magnel Laboratory for Concrete Research

Technologiepark Zwijnaarde 60

9052 Ghent

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N. De Belie, K. Van Tittelboom, S. Van Vlierberghe, L. De Meyst, M. Araújo, M. Reunes, J. Mortier, C. Malfait

Preface

The continuously growing world population and wide-spread industrialization increase the need for sustainable infrastructure. The construction industry currently is responsible for an important part of the environmental impacts related to the use of natural resources and energy, the production of waste, and greenhouse gas emissions. To minimize these impacts, our civil engineering structures need to become more long-lasting and smart. Since concrete is the most used construction material, increasing the durability of concrete structures is an important goal in this respect. To obtain such enhanced durability and sustainability, in the last decade several smart admixtures have been developed to impart self-responsiveness to this material, including self-sensing, self-curing, and self-healing. Carbon nanofibers and nanotubes have been used to make the concrete self-sensing and report when damage is about to occur or has occurred already. Layered double hydroxides can capture aggressive agents intruding into the concrete and can release corrosion inhibitors to prevent damage. Superabsorbent polymers have been developed to provoke internal curing and hence can mitigate autogenous shrinkage cracks; they can also self-seal cracks from intruding liquids and stimulate self-healing through the deposition of calcium carbonate and binder hydration products. Micro- and macro-capsules containing mineral or polymeric healing agents can provide autonomic self-healing properties.
With the International **Conference on Durable Concrete for Infrastructure under Severe Conditions – smart admixtures, self-responsiveness and nano-additions**, we want to offer participants a full overview of the most recent advances in the development of these smart admixtures. The compatibility of the smart admixtures with other concrete components and the effects on fresh and hardened concrete properties are considered. Modelling of the hydration reactions and microstructure formation in the novel durable concrete, of the activation of smart properties, of the service life in specific environments, and of environmental impacts, is of importance as well. Existing and emerging energy technologies also require that these materials perform in more and more extreme operating conditions as they are installed in sub-arctic/arctic areas (low temperatures, ice-abrasion), desert areas (high temperatures), along coast lines (high chloride contents), deep-sea or underground (large temperature gradients and high pressure). Evaluation of the resistance to extreme conditions is also included.

We hope that you will enjoy this opportunity to share your latest experiences, to discover new avenues for exploration, to meet colleagues, and of course to enjoy the beautiful historic city of Ghent.

Nele De Belie, Kim Van Tittelboom, Sandra Van Vlierberghe, Adelaide Araújo, Laurence De Meyst