Editorial

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This issue of *Construction Materials* contains papers on a range of topics relating to concrete. From modelling corrosion in reinforced concrete to the development of a new material parameter for calculating shrinkage stresses, the breadth of these papers shows that while concrete is a mature and well-understood construction material, there is always more to learn.

The first paper (Zhang and Canning, 2011) is a review of the use of non-conventional materials in the construction industry, the use of which has been prompted by the trend towards more energy efficient construction and designs. However, their introduction presents both opportunities and challenges to researchers and engineers worldwide. The authors provide examples of such materials as well as providing a model for the introduction of these materials into the market, using fibre-reinforced polymer composite bridges as a focus.

One conventional material that is being used in a non-conventional role is expanded polystyrene (EPS) as an aggregate in concrete. In this role, EPS can reduce the weight of concrete and increase its energy performance. Great improvements can be made in the strength of EPS-containing concrete by modifying the mix design with the inclusion of fly ash, silica fume and fibres. Chen and Fang (2011) study the effects of varying EPS particle size on the mechanical properties of such concrete. Their results reveal the various relationships between particle size, volume fraction, density, compressive strength and tensile strength.

Recent research findings have confirmed the positive role of sand-based aerated lightweight concrete in temperature insulation of buildings but the scarcity of sand in some parts of the world makes the use of earthy soils attractive. In fact, soil could be considered the more environmentally friendly and sustainable construction material, if the exploitation of sand resources and its excavation and haulage over distances are taken into account. Ng *et al.* (2011) evaluate the thermal insulation performance of aerated lightweight concrete of different densities produced by incorporating either 100% sand or 100% soil as filler. Their results show that the temperature gradient for soil-based aerated lightweight concrete panels was better than that of sand-based aerated lightweight concrete panels of comparable density. The authors felt this was partly

due to differences in the thermal conductivity of the sand and soil particles. Based on these temperature gradients, they believe the thermal insulation performance of soil-based panels was better than the sand-based equivalent and are confident the construction industry will willingly adopt soil-based aerated lightweight concrete in the future.

Staying with thermal effects, Hussain *et al.* (2011) investigate the severe environmental effects of chloride and temperature on the corrosion of reinforcing steel used in concrete engineering materials. Both three-dimensional finite-element engineering material modelling, as developed by the authors' research group, and field condition experiments, showed that corrosion in reinforced concrete structures increases non-uniformly with severe environmental loading such as high chloride concentrations and at high temperatures. The material model was in close agreement with experimental results in predicting corrosion rate and potential, demonstrating its efficiency and accuracy. The authors believe their research will be particularly relevant to construction material engineers solving problems in chloride-contaminated structures subjected to high temperatures.

Energy efficiency is, and will remain, a priority for construction engineers working in the built environment. Indeed, global warming and the soaring price of fossil fuels mean energy conservation and efficient design and construction in buildings are as important as ever. As such, different types of pozzolanic material are now being widely used to replace cement in high Portland cement concrete. This is to improve the mechanical properties and durability of the concrete, thereby delivering environmental and economic benefits. A range of techniques, from prolonged grinding to curing at elevated temperatures, can be used to enhance the reactivity of the pozzolanic material. However, not all of these methods are energy efficient or economical. With this in mind, Amin and Alam (2011) use different grinding and chemical techniques to activate bagasse ash. Each method enhanced the reactivity of bagasse ash although test results showed that for high ultimate strength, mechanical activation was more beneficial. Less beneficial effects were found when the bagasse ash was chemically activated.

Changes in moisture content is one of the most common sources of durability problems and performance failure

observed in concrete repairs. Baluch *et al.* (2011) have developed a new concept, α_{hygro} , or the coefficient of moisture contraction. This makes the calculation of stress that is the result of moisture movement much more convenient and obviates the need to measure shrinkage strain in the laboratory, as is current standard practice. The parameter can be established for concrete materials based on the test method outlined in the paper. The authors go on to determine values for normal and self-compacting concretes, and compute the restrained shrinkage stresses, using constituent materials from the Eastern Province of Saudi Arabia.

The issue closes with two book reviews, both covering a wide range of materials. The first book, *Materials: Engineering, Science, Processing and Design* discusses materials selection and performance and the subject of the second can be guessed from the title, *Sustainability of Construction Materials*.

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