

Editorial



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The duty of writing the editorial for the June 2011 issue of *Construction Materials* has fallen on my desk and it is my pleasure to introduce the papers in this issue. By training and experience I am a materials engineer and polymer physicist. It is therefore slightly anomalous that I should be writing the editorial for an edition that is almost exclusively about concrete.

However, progress in all modern technology is both underpinned and enabled by progress in materials technology. Indeed, it is no coincidence that the early years of mankind are referred to as the stone, bronze and iron ages or that the current age could be termed the oil or plastic age. New materials enable new technologies and new materials development is fundamental for any technological progress.

It is perhaps too easy to focus on the development of new materials and to ignore the constant and continued progress in understanding and improving existing materials. This valuable work enables progress and the development of new technologies as much as the development of new materials.

Concrete and concrete-based products are one of the great families of materials and in volume, probably the largest of the materials families. It is also one of the oldest of the modern materials and it is encouraging to see that the development and improvement of concrete continues throughout the world. Our modern infrastructure would not be possible without the application of improved concrete products and this issue of *Construction Materials* documents that continued progress and technology development.

The first paper by Shayan (2011) discusses the selection of aggregate for durability in concrete structures and the testing that is necessary to allow the correct aggregate selection. The properties of a selected aggregate have a significant influence on the performance of the concrete made from it and there are a range of national and international tests for aggregate performance. However, the author discusses two areas where the existing tests do not adequately reveal the dimensional and chemical stability of the aggregate. First, current test methods do not adequately measure the drying shrinkage of aggregates. High values of drying shrinkage in aggregates will lead to shrinkage cracking and deterioration of the concrete due to ingress of agents and potential corrosion. The paper proposes the development of a test method for measuring this property.

Second, current test methods do not adequately predict the susceptibility of aggregates to alkali–aggregate reaction (AAR) in concrete. Failing to predict AAR can lead to expensive failure and very high repair costs. The paper proposes the development and adoption of tests for AAR in slowly reactive aggregates.

The second paper by Ramli and Dawood (2011) looks at improving the properties of high-strength flowing concrete (HSFC) by including various levels of short steel fibres as reinforcement. The properties selected for investigation are density, compressive strength, flexural strength and an index of toughness. Short fibre reinforcement is a well known method of increasing the mechanical properties of many types of concrete and the paper shows that this is also true for HSFC where steel fibres increase the density, compressive strength, flexural strength and toughness index of the HSFC mixes studied. The study shows that not varying the level of steel fibre addition had different effects on the properties studied, i.e. 1.0% steel fibre was most effective for increasing the compressive strength whereas 1.5% steel fibre was most effective for increasing the flexural strength.

The paper by Dawood *et al.* (2011) also looks at high-strength concrete and the effect on mechanical properties of using a superplasticiser high-range water-reducing admixture (HRWRA) and pumicite. The mechanical properties studied are compressive strength, splitting tensile strength, flexural strength, static modulus of elasticity, absorption and air dry density. The use of HRWRA leads to an increase in the mechanical properties with and without the inclusion of pumicite. When pumicite was included in the mix as a partial replacement of the cement, the mechanical properties were further increased and the most suitable percentage of pumicite inclusion was determined to be 7% as this gives the highest pozzolanic activity index for the mix.

The fourth paper by Lotfy *et al.* (2011) investigates and evaluates the behaviour of one-way concrete slabs reinforced with glass-fibre-reinforced polymer (GFRP) rebars under distributed and line loads. Using GFRP rebars led to an increase in ultimate flexural strength and increasing the concrete strength of the slabs led to an increase in slab rigidity and consequent improved flexural capacity. Interestingly, the failure mode for GFRP reinforced slabs is considerably

different to that of conventional ductile steel reinforced slabs. For GFRP reinforcement the failure occurs firstly by crushing of the concrete and then excessive GFRP rebar end slip and this must be prevented by either using additional supports or by increasing the surface roughness of the rebars.

The final paper by Assaad *et al.* (2011) evaluates the effect of various parameters on the properties of underwater concrete (UWC) and the effect of washout loss. Conventional tests for washout loss do not adequately model the high hydrostatic pressures resulting from deep placement of UWC and particularly interesting is the development of a new test to simulate washout loss at high hydrostatic pressures. This test provides a more realistic assessment of washout loss in deep placements and it was found that increasing the depth of casting increases the washout loss until a threshold was reached, after which significant washout loss occurred. Washout loss was also found to have a high correlation with the residual compressive strength of UWC mixtures. The paper demonstrates that the use of gum-based anti-washout agents could greatly reduce water dilution of UWC while increasing flow resistance and cohesiveness.

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