Proceedings of the Institution of Civil Engineers
Construction Materials 163
August 2010 Issue CM3
Pages 125–126
doi: 10.1680/coma.2010.163.3.125

John Forth
Senior Lecturer,
University of Leeds, UK

Institution of Civil Engineers

Editorial

J. P. Forth BEng, PhD, MASCE

I am very pleased to have the opportunity to introduce this August edition of *Construction Materials*. Whilst the study of concrete or cementitious bound materials remains a dominant theme, the editorial panel of the journal always strive to achieve a mixture of publications on all material topics for each issue. We are grateful, therefore, that the variety of contributions submitted over the past 3 years has made this easy to achieve. That said, it may seem that this issue exhibits a degree of bias towards cementitious materials. However, the intention here is to highlight the attempts to improve the sustainability of concrete and concrete products and the novel materials that can be used to achieve this. I think it is also fair to say that the range of topics is still present and is clearly evident from the briefing on the structural testing of full-scale fibre-reinforced concrete panels (Barnett *et al*., 2010) to the paper on enhanced stabilisation of soil using slag (Nidzam and Kinuthia, 2010).

It is very encouraging to see the global drive to improve the sustainability of cement-bound materials. From the UK, Oti *et al.* (2010) investigate the engineering properties of concretes made with slate waste – with the slate waste acting as a cement replacement. As well as aiming to reduce the content of cement, they also propose a new use for a waste material that would otherwise have been sent to landfill. Across the globe in China, Portugal and Austria, Ding *et al*., (2010) investigate the use of metamorphic rock waste (slate waste) as a cement replacement.

Whilst there is some similarity between the aims of the two investigations, Oti *et al.* (2010) concentrate on the physical properties of the waste aggregate and the concrete that is subsequently made from it, investigating the behaviour by also examining the microstructure of the matrix. As well as workability and compressive strength, Ding *et al.* (2010) also consider the durability of the concrete and examine the shrinkage behaviour. Both investigations conclude that slate waste can be used as a cement replacement, although only when producing low-to-medium strength concrete.

Maslehuddin *et al.* (2010) from Saudi Arabia, also investigate the potential for reducing the quantity of cement by using cement kiln dust (CKD) as a cement replacement material in blended cement concretes. Cement kiln dust is a problem as it contains high levels of chlorides and alkalis and is mostly disposed of to landfill. From their investigations, which discuss blending CKD with either silica fume, fly ash or blastfurnace slag, they show that 10% CKD could be utilised when blended with either 5% silica fume or 10% fly ash. The increased electrical resistivity of these blended cements indicates that their corrosion resistance may be greater than normal plain cement concrete. However, the shrinkage of the concrete made from these blended cements was around 400% greater than plain concrete, which is an issue.

Ground granulated blastfurnace slag (ggbs) is a by-product of the iron making industry and is well recognised as a cement replacement material. However, Nidzam and Kinuthia (2010) investigate the effects of incorporating ggbs in the soil stabilisation process. A common problem which results from the use of lime as a stabiliser is the generation of a soil with a more ‘open structure’ (reducing the density). This capacity to hold large amounts of water can be a liability in certain cases where, for instance, sulfate ion species are present. Ultimately, large internal expansions can be created which are detrimental to the coherence of the soil matrix. The use of ggbs is shown here by the UK authors to improve the robustness of the soil system whilst also making the stabilisation technique more sustainable.

The first four papers concentrate on the use of waste or by-product materials as replacements for existing less sustainable binders/aggregates. However, it is perhaps important to realise that research of this type is only the first step along what can be a very long road to getting the proposed novel technology accepted by the relevant regulatory bodies. Who would market this new material; what are the commercial implications; and who would generate, if required, the appropriate waste protocols to show compatibility with existing products? Perhaps a potential way forward to ‘fast-tracking’ these novel materials is to follow the approach adopted by Robinson *et al.* (2010) which is a collaboration between academia and a major industrial organisation.

In the UK, Robinson *et al.* (2010) investigate the potential of a novel manufacturing technique (microwave vitrification) that could be used to produce lightweight aggregates from a by-product of aggregate production (quarry fines) which would be suitable for use in lightweight aggregate building blocks. These new aggregates would replace the need for materials currently imported into the UK such as pumice. Encouragingly, the study has shown that it is possible to produce lightweight aggregate from fly ash and mineral by-products. Future work is required to quantify the cost implications of a scaled-up commercial process.

The final paper from Canada turns our attention to self-compacting concrete. Al-Martini and Nehdi (2010) advocate the use of self-compacting concrete instead of traditional concrete in hot climates. The aim is to optimise construction by limiting the number of wasted mixes that occur in this environment when using traditional concrete mixes. The authors specifically investigate heat and mixing time on the slump loss and compressive strength of self-compacting concrete containing different superplasticisers (polycarboxylate, melamine sulfonate and naphthalene sulfonate).

Finally, opening the issue is a briefing by Barnett *et al.* (2010) from a UK consortium. The paper describes full-scale explosion testing of ultra-high-performance, fibre-reinforced concrete panels. The resilience of our infrastructure is compromised in many ways. This issue of the journal has highlighted the sustainability of materials but has also inferred how enhancing sustainability could introduce durability problems. Clearly, in this day and age, terrorism is a component of our lives and a threat to the resilience of our infrastructure. The research at Liverpool and Sheffield has led to the development of a material which improves the resistance to explosions and limits spalling/creation of shrapnel from this type of blast loading.

REFERENCES

Al-Martini S and Nehdi M (2010) Effects of heat and mixing time on self-compacting concrete. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 175–182, **doi**: 10.1680/coma.800047.

Barnett SJ, Millard SG, Schleyer GK and Tyas A (2010) Briefing: Blast tests of fibre-reinforced concrete panels. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 127–129, **doi**: 10.1680/coma.900017.

Ding Y, Jalali S and Niederegger C (2010) Recycling of metamorphic rock waste in ecological cement. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 143–148, **doi**: 10.1680/coma.800017.

Maslehuddin M, Al-Amoudi OSB, Kalimur Rahman M, Shameem M and Ibrahim M (2010) Use of cement kiln dust in blended cement concretes. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 149–156, **doi**: 10.1680/coma.2010.163.3.149.

Nidzam RM and Kinuthia JM (2010) Sustainable soil stabilisation with blastfurnace slag – a review. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 157–165, **doi**: 10.1680/coma.2010.163.3.157.

Oti JE, Kinuthia JM, Bai J, Delpak R and Snelson DG (2010) Engineering properties of concrete made with slate waste. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 131–142, **doi**: 10.1680/coma.800062.

Robinson JP, Parry AR, Grenfell JRA and Ghazireh N (2010) Microwave vitrification for lightweight aggregate manufacture. *Proceedings of the Institution of Civil Engineers, Construction Materials* **163(3)**: 167–174, **doi**: 10.1680/coma.2010.163.3.167.