Editorial

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Construction materials are exciting. This seemingly implausible assertion is hopefully regularly demonstrated by this journal, which constantly seeks to find new and better ways of using traditional or established materials, whilst also searching for and evaluating new, novel and/or innovative materials. The latter can range from developing wholly fresh ideas and products to exploring the possibly beneficial properties and uses of existing wastes and byproducts, thereby fashionably yielding accompanying environmental advantages and helping to achieve welcome improvements in sustainability.

These forms of ‘excitement’ prove to be vital contributions to the modern world of construction materials, where traditional materials must be used in ways that are at once more economical, more aesthetic, more durable and more environmentally acceptable. Our old friend concrete for example, which remains the primary choice for construction worldwide, must now be more affordable, less visually offensive (‘architectural’ or attractively clad), easier to use, more enduring (without evidence of even normal weathering) and more sustainable, all whilst achieving ever-increasing improvements in engineering performance.

Aspects of these demands on modern materials provision are well illustrated by the five excellent papers featured in this issue. One paper finds a practical solution to difficult materials in a particular and rapidly developing region while the remaining four papers address various issues that more or less apply globally.

Road construction in the Middle East confronts many challenges that are characteristic of hot, dry climatic conditions and the resultant geological and geomorphological terrains, including the occurrence of gypsum-rich soils. The paper by Razouki *et al.* (2011) demonstrates that such gypsiferous soils can be successfully and economically used for building roads in Iraq by compacting the active zone of embankments at the wet optimum moisture content instead of the dry optimum moisture content.

Slaked lime (calcium hydroxide) is one of the oldest man-made building materials. It is generated by burning limestone (calcium carbonate) to create lime (calcium oxide) which is then ‘slaked’ or hydrated for use, after which it gradually reacts with carbon dioxide in the atmosphere to re-form calcium carbonate and thus essentially revert to its original ‘limestone’

form. The use of building lime declined after the development of Portland cement, but has recently enjoyed something of a revival. The splendid review by Livesey (2011) describes its modern production and use, emphasising its advantageous properties and how this historic material is so well attuned to current requirements.

Much research has concentrated on detailed mechanisms that can cause the premature deterioration of modern concrete materials around the world, but it is corrosion of reinforcement, and especially that promoted by chloride ingress, that is by far the most common cause of problems with concrete structures. Das *et al.* (2011) review the situation concerning concrete highway structures and buildings in the UK, with particular reference to mitigation measures, and conclude that cathodic protection is the most cost-effective and proven method for rehabilitating affected structures.

If the three papers mentioned so far have only (but usefully) moved the boundaries of our existing practice or know-how, the fourth paper (Joseph *et al.*, 2011) certainly seeks to hit the ‘excitement’ button. This fascinating review introduces us to a new generation of ‘smart’ materials and particularly focuses on ‘self-healing’ cementitious options, seeking to reduce whole lifetime costs by improving durability and eliminating the need for regular maintenance. It is a tantalising glimpse of the possible future of construction materials.

Finally, this exciting pace is maintained by the practical development in India of a ‘geopolymer’ (a cement-like binder made using byproducts), activated by an alkaline solution that is also an industrial effluent. A preliminary paper by Deevasan and Ranganath (2011) describes promising experiments using fly ash from a power station, alkaline effluent from a poly-fibre factory and the controlled addition of sodium silicate to create the geopolymer. A limited initial programme of testing using this geopolymer to bind granite coarse and river sand aggregates suggests that potentially the ‘ecologically unfriendly’ byproducts could be successfully consumed in the manufacture of a useful concrete.

I hope you will experience some ‘excitement’ in reading the papers in this issue and I welcome your comments and other contributions in future issues.

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