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Editorial

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It is a great pleasure to once again write the editorial for the latest edition of *Construction Materials*. Vernacular construction has always made very good use of available plant-based materials, such as wood, bamboo and reeds. In recent years, it is very notable how the mainstream construction market for well-established bio-based materials like timber, as well as less-established materials such as hemp and straw, have grown as the wider sector explores alternative products and solutions. The recently opened University of East Anglia's Enterprise Centre is an excellent example of delivering a very low energy building design using engineered timber, cellulose insulation and thatch. In very different ways, the three research papers in this edition make their contribution to further developing the use of plant-derived construction materials.

Wood has a long and successful history in construction around the world. In recent years, its popularity has markedly increased for structural and internal non-structural applications, but also for use in external cladding and building facades. However, concerns about the durability of wood-based materials exposed to external conditions persist. Understanding good design and construction practices, selection of appropriate materials and material treatment processes should ensure long-term satisfactory performance. However, scientific characterisation and understanding the long-term performance of wood is not well developed. In their paper, Gupta *et al.* (2015) have used Fourier Transform Infra-Red (FTIR) spectroscopy to study the performance and degradation of nine types of wood. FTIR spectroscopy was used successfully to characterise performance patterns of the natural and artificially exposed specimens, with preservative-treated and chemically impregnated materials showing, as expected, improved performance over natural materials.

In the second wood-related paper in this edition, McConnell *et al.* (2015) present a study of post-tensioned glue-laminated (glulam) timber beams for structural applications. Post-tensioning is a technique more commonly associated with concrete and to a lesser extent masonry, although in recent years it has been increasingly applied to timber, especially in regions such as New Zealand where earthquakes persist. Of course, post-tensioning is a long-established non-construction application in timber products, including the use of heated iron rings on wooded carriage wheels and barrels for example. Benefits of post-tensioning for concrete structures – reduced in-service deflections and increased strength – also apply to timber structures. In addition, strengthening offers potential to improve the ductility of timber structures, hence the interest in seismically resistant applications. In their study, McConnell *et al.* (2015) tested twenty glulam beams, comparing the performance of reinforced and post-tensioned beams using basalt FRP tendons, with unreinforced timber sections. As expected, the stiffness, strength and ductility were successfully improved by post-tensioning. In common with other materials, losses in pre-stress force is a wider concern and challenge with timber, and the authors are studying this in further work as well as exploring alternative non-metallic tendons.

Developing higher value uses of waste materials, while at the same time reducing our reliance on non-renewable resources, remains a challenge for the construction industry. In addition to wood, the use of other bio-based materials such as hemp and sheep's wool insulation has increased in recent years. The greater use of biomass for power generation has seen a reduction in availability of traditional fly ash but also opens new opportunities. Incorporating waste materials into masonry units offers a relatively low-risk and potentially commercially viable solution for construction applications. In their paper, Oti and Kinuthia (2015) present work developing stabilised brick and mortar from biomass waste materials. The authors suggest that there is potential for using both biomass and magnesium quarry waste materials to produce both bricks and mortars. However, to increase reported compressive strengths and reduce the reliance on the relatively high cement contents, further work is needed.

Appearing before these reviews in the issue is the Briefing paper by Ledzion (2015), which presents the latest innovations in materials testing related to tunnel construction. The consequences of failure during intrusive materials sampling and testing can of course be significant. Experience drawn from recent projects, including Crossrail, are used to illustrate how modern practices have developed to reduce risk of failure in this specialist field.

We hope you enjoy the latest edition of *Construction Materials* and, as always, we welcome your feedback and thank you for your support.

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