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Construction Materials

Editorial

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The start of an article, the first few sentences of the introduction, often can be placed in one of two categories. In the first category a step back is taken from the actual topic and a world problem is addressed first. This topic could be about consuming 40% of the total energy absorbed globally. Another example, something that I didn't know, could be about our population growing an estimated 26% by 2050 to 9.7 billion people. Or it could deal with environmental scarcity of resources regarding depletion of groundwater levels reaching alarming levels in India. These examples are not random. They are taken from three of the articles in this issue of *Construction Materials*.

The second category plunges right in and goes straight into the details. The first article in this issue follows that approach. From the first sentence your attention is drawn into mechanical properties of PC and it being influenced by binder, filler, aggregate and the adhesion between these components. When you are like me, you will probably have automatically converted PC to Portland cement, in which case you are wrong! I will tell you about the correct term in a minute.

The common denominator for all the articles in this issue of *Construction Materials* is that they are all about concrete, a very important construction material. However, we are building with other materials too. Hence, also keep sending in articles on, for example, asphalt and wood, preferably with a biobased initiative in it if possible. *Construction Materials* is a journal where we would like to read about innovations on all these materials.

Coming to the menu of the current issue. Our first article is about PC, not Portland cement, but polymer concrete. Niaki *et al*. (2023) take us through their design process, where they adjust basalt fibre levels and nanoparticles and investigate different resin systems. They start with an epoxy-based PC. To improve the mechanical properties, the authors investigate addition of basalt fibres in a first step and different concentrations of nanoclays in a second step. In the final step, the epoxy matrix is completely replaced by a rigid polyurethane or a rigid polyurethane foam. Such a change in components of concrete of course provides a range of options. Which option best suits your own situation, you can read in the first article of this issue.

The second article kind of takes over at the cliffhanger of the first article. That article ends with the suggestion that polyurethane foam PC could be used in the fabrication of ultra-lightweight precast members, isolators and porous lightweight structures. The second article revolves around pervious concrete. Pervious concrete, also known as no-fines concrete, allows the percolation of water through the interconnected void structure. Singh and Singh (2023) mention that the accumulation of water along roads and around building areas can easily be directed to rain-harvesting boreholes with the help of pervious surface drains. Thus, harvesting rainwater at a larger scale could be a way of replenishing groundwater levels in India.

The research by Singh and Singh (2023) is on recycled concrete aggregates, which is environmentally favourable, but could lead to lower strength. To compensate for strength reduction, they experiment with adding a mixture of fly ash, metakaolin and silica fume. Although these fine additions could increase the strength, they could also block part of the percolation network. Hence, read this article to become familiar with the delicate balancing act between strength and percolation to create pervious concrete.

Where the second article is all about the binder matrix, the third article looks at a natural material to replace steel reinforcement. There are several natural fibres that may serve as reinforcement. Some of them, like abaca, coir, jute, kenaf and sisal, are promoted by the Future Fibres campaign of the Food and Agriculture Organization of the United Nations. Next, it is good to notice that the authors of the third paper are all from Brazil. And Brazil is the main producer of sisal fibres, accounting for 40% of the world production. Hence the topic of the third paper is natural sisal fibres.

Guizzardi *et al*. (2023) study in particular the ideal length and volume fraction of cement-based composites reinforced with randomly distributed natural sisal fibres, as there exists very little information on this particular topic. Two lengths (5 mm and 20 mm) and five different fibre content volumes are studied. No fibre treatment was applied to the fibres in this study. The fibres were free from impurities (< 1%) such as pectic substances, plaits, knots, leaf fragments, bark and any other details. The authors look at water uptake, workability and mechanical properties before they draw their conclusions.

The final paper of this issue takes under investigation the effects of phase-change materials (PCMs) on the performance of cement mortar. PCMs are unique thermal-storage materials that consume or discharge large quantities of thermal energy due to changes in their actual state during temperature variations. Palampalli *et al*. (2023) selected polyethylene glycol as the PCM core and polyvinyl alcohol as the encapsulation material.

Three different PCM contents are studied at three different temperature levels. Palampalli *et al*. (2023) looked at density, compressive strength, flexural strength, water absorption, thermal conductivity and, of course, thermal analysis. In the thermal analysis they also used Comsol Multiphysics modelling to simulate the heat transfer through a simple building. Their conclusion is that the temperature variation inside the building made with conventional brick walls was 2.5°C, whereas in a building with walls made of PCM mortar blocks the variation was only 0.5°C. For the complete story and detailed results, please read the fourth article in this issue.

And that concludes the four articles we have lined up in this issue. All about concrete, but all with some innovations that look particularly toward the sustainable goals for our planet. And thus, I have taken a step back, from the details of the individual articles to the larger picture for our entire planet. I hope that you will find this issue interesting and am looking forward to more intriguing articles about the wide variety of construction materials we all use.

REFERENCES

Guizzardi GZ, da Silva Machado M, Michelon W and Filipak Vanin DV (2023) On the mechanical behaviour of cement paste reinforced with natural sisal fibres. *Proceedings of the Institution of Civil Engineers – Construction Materials* **176(6)**: 255–262, https://doi.org/10.1680/jcoma.21.00007.

Niaki MH, Ahangari MG and Fereidoon A (2023) Mechanical properties of reinforced polymer concrete with three types of resin systems. *Proceedings of the Institution of Civil Engineers – Construction Materials* **176(6)**: 233–241, https://doi.org/10.1680/jcoma.21.00060.

Palampalli P, Raj A and Mini KM (2023) Effects of phase-change material on performance of cement mortar at varying temperatures. *Proceedings of the Institution of Civil Engineers – Construction Materials* **176(6)**: 263–276, https://doi.org/10.1680/jcoma.21.00022.

Singh D and Singh SP (2023) Properties of pervious concrete with recycled concrete aggregates and cement replacements. *Proceedings of the Institution of Civil Engineers – Construction Materials* **176(6)**: 242–254, https://doi.org/10.1680/jcoma.20.00086.