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Editorial

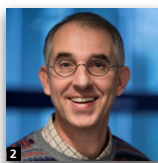
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Editorial

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This themed issue of *Construction Materials* is devoted to the alkali–aggregate reaction (AAR) in concrete materials. AAR is still one of the major problems affecting the performance and ageing of specifically mass reinforced concrete. *Construction Materials* feels very fortunate that it could team up for this issue with António Santos Silva of the organising committee of the 16th International Conference on Alkali Aggregate Reaction (16th ICAAR), that took place at LNEC in Lisbon between May 31st and June 2nd, 2022.

The ICAAR is a world-renowned conference on the degradation of concrete by AAR, its prevention and remediation, their consequences and the repair of the affected structures. In the 16th ICAAR the effect of coupled AAR and delayed ettringite formation (DEF) in concrete were also addressed. For this conference more than 180 papers were accepted to be presented. A few topics were specifically selected for this themed issue of *Construction Materials*.

To illustrate the impact of AAR on structures, the first paper of this issue is used. Santos *et al.* (2022) introduce us to a set of seven bridges located in the reservoir of Aguieira dam in the centre of Portugal. These bridges were built between 1976 and 1979, roughly 40 years after the first indications of and publications on AAR (Stanton, 1940). When the bridges were only 30 years old a first set of rehabilitation works was already necessary. Another 10 years later more severe rehabilitation was carried out on the piers and foundation (see Figure 1 for example), all required due to AAR/DEF. One of the bridges was even replaced, because of the high costs of the rehabilitation works required.

To monitor the progress of AAR/DEF and the effectiveness of the rehabilitation work, a structural health monitoring system was set up. The objective of the monitoring system was to quantify the transfer of load from the original pier to the new piles, as well as the development of the transfer over time. The first paper presents the monitoring system implemented and the results obtained so far.

Rather than monitoring, scientists are working hard to be able to predict behaviour using finite-element modelling of AAR. This is the topic of the second paper, written by Nour and Cherfaoui (2022). Starting from a chemomechanical model of AAR for concrete, their paper presents the implementation of the chemomechanical model in Abaqus/Explicit modelling software. The model is considered as an engineering tool, hence it addresses AAR at a macro scale, using few input engineering parameters without compromising accuracy. Read their paper to see how the model was validated and applied to a large hydraulic structure located in North America to predict displacements and concrete characteristics over time due to AAR.

A next step in fighting AAR would of course be mitigation actions. This is addressed by Hooton and Fournier (2022) in the third paper of this issue. The authors have studied the impact of high-alkali Portland cements on mitigation measures of prescribed levels of supplementary cementitious materials as required by the Canadian standard. They report on the long-term performance (after 12 and 27 years) of prisms and outdoor concrete blocks. The performance of the outdoor blocks is also compared with the performance based on the results of accelerated mortar bar and concrete prisms tests. You should draw your own conclusions, but the results look hopeful in terms of mitigating measures that are possible.

The final paper of this issue draws our attention to the next step in alkali-related issues. It is not from the 16th ICAAR topics, but it takes us to the area of embodied carbon dioxide emissions associated with Portland cement production. One of the leading initiatives to lower embodied carbon dioxide emissions is through alkali-activated materials. Marsh *et al.* (2022) report on the scale-up effects in alkali-activated soil blocks.

We can read in the fourth paper that there are two distinct approaches to the stabilisation of soils by alkali activation. One approach is to add a reactive aluminosilicate precursor (e.g. fly-ash) to the soil. The other approach is to use the soil itself as the sole precursor, relying on the clay minerals in the



Figure 1. Criz II Bridge at the end of the rehabilitation works (Santos *et al.*, 2022)

soil to react with the alkaline activator. In this paper the latter approach is studied. The authors discuss the effect of alkali activation on compressed blocks of earth, to enhance their strength and durability.

These are the papers that make up this themed issue of *Construction Materials*. The papers were carefully selected, contributing to compose a thematic issue of high interest and quality, and proposing new perspectives for future investigations in AAR.

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