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Guest Editorial

The 10th International Conference on Alkali–Aggregate Reaction (AAR) was held in Melbourne, Australia in August 1996. Prior to and during the Conference, many engineers, researchers and geologists working in the area of AAR had approached this Editor, and enquired if all the Keynote papers could be assembled into a special issue of *Cement and Concrete Composites* in order to have a readily available, compact and up-to-date state-of-the-art report on the subject. Keynote papers themselves contain valuable information in the chosen area, and often extensive consultation, it became quite clear that such a compilation could serve the engineering community in synthesizing the complex and vexed problems of AAR in concrete construction. This particular special issue is the result of these suggestions, and the Editor is very grateful to all those who have contributed to the issue.

Unfortunately not all the Keynote lecturers at the 10th AAR Conference could be included in the special issue. Fortunately, however, the Chairman of the Organizing Committee of the AAR Conference agreed to write an overview, and another timely paper on accelerated testing was available for inclusion in this special issue. The last two papers were reviewed as usual, whilst the Keynote Papers had been reviewed earlier by the Organizing Committee of the AAR Conference. This volume thus forms an authoritative report on some of the critical areas of AAR which still elude our understanding and perception of their significance and implications.

Professor Diamond's paper addresses some of the unknown problems associated with AAR. It is shown that the addition of alkalis to the mix water to accelerate the reactivity may enhance the sulphate concentration and lead to delayed ettringite formation. Thus adding alkali hydroxide to a low alkali cement is not a recommended test to stimulate the effect of ASR arising from high alkali cement. Similarly, silica fume in concrete may induce ASR distress rather than mitigate it, particularly when the silica fume consists of significant amounts of coarse grains or undispersed agglomerates.

The problems of identifying reactive aggregates, and the difficulties of developing a test method which is rational, sound and at the same time, able to realistically assess aggregate reactivity are well known. This becomes particualrly critical when the residual expansion, or the potential for further reactivity in an existing structure affected by ASR is to be evaluated. Four of the papers included in this issue discuss these problems, and they emphasize the need to understand the chemical processes involved where the two major parameters that characterize and differentiate accelerated tests, namely, temperature and chemical environment, are varied. It looks as if we are still a long way away from an acceptable test method which is sufficiently quick, and yet reliable, repeatable and meaningful.

Modelling AAR in concrete is beset with some basic and fundamental difficulties. We have a phenomenon that arises from chemical reactions,

and this is compounded by their being time-dependent, and very much influenced by the environment, as well as a set of complex internal factors which are highly variable and indeterminate. Nevertheless, various attempts are being made to model the reactivity, and the Keynote paper by Professor Moranville-Regourd shows a possible way forward to address this problem.

The assessment and rehabilitation of AAR-damaged structures is going to be with us for a long time to come. The Keynote paper on this topic makes a comprehensive evaluation of the problem, and shows that the only way forward is to have a clear understanding of the material and structural implications of AAR. Tests and test methodologies will be critical in structural evaluation, and false premises can lead to wrong diagnosis and solutions.

The Editor hopes that this special issue will help us better to understand the problem of AAR in concrete. In the present world climate of economics and infrastructure regeneration, the disease is unlikely to be eradicated from the construction scenario. What we need is a clear and accurate grasp of what constitutes AAR, an understanding of the mechanics of its progress, a sound engineering approach of preventative methods in new and existing structures, and an ability to design for material stability and structural integrity.