

Book reviews

Application of NMR spectroscopy to cement science

P. Colombet and A. R. Grimmer

Gordon and Breach, 1994, ISBN 2 88124 965 5, £117.00, 484 pp

This book presents written proceedings of a conference held in March 1992. Its 31 papers are collected into thematic areas. These include advances in instrumental methods and analytical techniques, structural characterization of local environments in anhydrous aluminates and silicates, hydration reactions, ions in solution and the texture and porosity of pastes. An introductory section describes the chemistry of cement, including its hydration, and presents an introduction to NMR spectroscopy as applied to cement science.

The papers are written to a high standard, and the book, perhaps the first of its kind, is a welcome addition to the technical bookshelf. As is inevitable with conference proceedings, there is some duplication and overlap between contributions but, on the whole, each contribution contains significant new information. One of the achievements of the book is to focus attention on the range of applicability of NMR; it can be used to image water distribution in pores, to characterize voids and to determine the speciation of aqueous ions as well as

determining Al and Si environments. Thus NMR emerges as a specialized but broadly-based instrumental method for the study of a wide range of chemical and physical features.

The difficulties of characterizing nearly-amorphous mixtures, or mixtures of amorphous and crystalline materials, are well known to cement scientists. As well as revealing the present broad range of applicability of NMR to cement science, the contributions promise further rapid advances in methodology and interpretation.

The book is recommended primarily to advanced researchers, but students should also find the introductory papers of considerable interest. The quality of the book is above average for camera-ready copy. However, it is unfortunate that at the price the publishers did not achieve better reproduction of photomicrographs and a more adequate subject index.

F. P. GLASSER
University of Aberdeen

Materials science of concrete IV

J. Skalny and S. Mindess (Editors)

American Ceramic Society, 1995

The new volume of *Materials Science in Concrete* is the fourth in a well-established series that was initiated in 1989. The object of this series is to present state-of-the-art reviews on topics that are in the forefront of research

and development in cementitious matrices and concretes. The reviews, prepared by leading experts in the various fields, provide an excellent overview of the different topics, in terms of presentation of up-to-date information

as well as critical evaluation of the state of the art. It is thus an extremely useful source of information for both the available knowledge and its limitations. It provides a wealth of know-how and ideas that can inspire future research and aid in selecting the research directions. Obviously the views are not always balanced, and they sometimes present the biased opinion of the author. This is not necessarily a disadvantage, since these views come on top of the review and they can inspire the reader.

The present volume consists of ten chapters. The first, by Rarick *et al.*, deals with surface area measurements by gas absorption. It reviews the theory, the experimental methods and discusses extensively the application for C-S-H measurements. It concludes with an in-depth discussion of the interpretation of test results. The second chapter, by Sorrentino *et al.*, deals with hydration of calcium aluminates. It addresses the hydration of pure compounds, that of the cements themselves and their interaction with other compounds such as silica, sulphates and chlorides. Attention is also given to properties of engineering significance such as strength and conversion.

The mechanism of superplasticity is reviewed in a third chapter by Sakai and Daimon presenting the various mechanisms of dispersion. The topic of delayed ettringite formation is given a special treatment in the fourth chapter, written by Lawrence. It provides a critical review of this issue and deals directly with evaluation and comparison between the various mechanisms suggested, and concludes with an excellent discussion of the whole topic.

Computer simulation is discussed in the fifth chapter by Bentz *et al.* It provides an overview of the modelling with respect to the formation and characterization of the concrete microstructure and advances beyond that to treat engineering properties such as transport, elastic properties and fracture. It clearly provides an in-depth insight into this developing field and points towards its potential usefulness. The topic of electrical properties (conductivity and impedance) is presented in the sixth chapter by Gu *et al.* and Beaudoin. It deals with the theory, test methods and their interpretation in cementitious systems, and

discusses their application.

The topic of cement–aggregate interfaces is reviewed by Mindess and Alexander in the seventh chapter with reference to mechanical properties. The chapter deals with the measurements, and with critical evaluation of the test data, and discusses their influence on the bulk properties of concretes. Durability in freezing and thawing conditions is the subject of the eighth chapter by Marchand *et al.* It deals with both the scientific concepts and the engineering implications. Creep and damage are dealt with in the ninth chapter, authored by Bazant. It addresses the modelling issues based on the extensive studies of the author.

The tenth and final chapter, by Spellman and Skalny, deviates from the previous ones, as it deals not with a scientific problem but with the usefulness and potential of specifications and standards. Although different, it ties in with the overall scope of this series to remind us that scientific research is not done in a vacuum and should link with technological developments needed by society. Although standards are considered by some as an obstacle to innovation, they can become a useful tool to advance new technologies and implement scientific research if the scientific community gets involved.

This book is thus an excellent compilation of state-of-the-art and critical evaluation of topics of current interest. It should be noted that in addition to the high-level presentation of the topics, the authors have made a great effort in producing excellent illustrations which make the reading of this book so much more pleasant and clear. Thus, this volume, like the previous ones in this series, is highly recommended for all those involved in cement and concrete research. It is extremely useful for those working in the topics dealt with in the book and for those of us who want to keep up to date in recent developments and have limitations in time and access to the extensive information published in scientific journals.

A. BENTUR

Technion-Israel Institute of Technology

Advances in cement and concrete

M. W. Grutzeck and S. L. Sarkar (Editors)

American Society of Civil Engineers, New York, ISBN 0 7844 0034 2, \$56.00

This book contains most of the papers (about 40, plus poster abstracts) presented at a recent National Engineering Foundation Conference (24–29 July 1994). The organizers succeeded in attracting a truly international representation and, moreover, in publishing the papers presented rapidly. The result is among the more informative and useful of recent conference proceedings. Papers are grouped under eight headings: cement and

concrete; past and present; clinker processing and quality; hydration of cementitious materials; fracture and fibre reinforcement; chemical and mineral admixtures; performance and durability; environmental issues and waste management; and future directions. The collected papers have sufficient value to warrant a place in most research libraries.

F. P. GLASSER