

Book Reviews

Polymers in Concrete by Satish Chaudra and Yoshihiko Ohama. Published by CRC Press Inc., 2000 Corporate Blvd, N.W. Boca Raton, Florida 33431, USA, 1994, ISBN 0-8493-4815-3, Library of Congress Card Number 93-29292. Price: £99.50

Although there are many historical examples still existing today showing the use of natural polymers in building materials, and although synthetic polymers and resins have been widely incorporated since about 1920 in concrete construction in some form or other, there is still a considerable lack of understanding of the role of polymers in concrete materials and the benefits in properties that they impart to the fresh and hardened concrete. This situation needs to be corrected urgently not only to enhance the quality of construction materials but also because of the need to provide a more corrosion-resistant cement matrix for steel reinforcing bars. This book combines the expertise and experience of two well-known authors, noted for their extensive research and developmental work on concretes utilising polymers, and provides an admirable text to fill the vacuum in our knowledge on the use of polymers in concrete.

The book contains eight chapters and a good subject index. After an introductory chapter, the authors give a brief historical review on the use of natural and synthetic polymers in concrete. This chapter includes an interesting table which shows the interaction of natural and synthetic organic materials according to the properties they impart. The durability problems in concrete such as carbonation, alkali–aggregate reactivity and freeze–thaw resistance are then discussed and this is followed by a fairly comprehensive description of the mechanisms involved in the various forms of deterioration encountered in concrete.

To many engineers the term ‘polymer’ is often confusing, and the type of polymer and its relevant application are not always quite clear. The inclusion of a chapter giving a clear

description of the classification of concrete–polymer composites according to the role and function of the polymer should go a long way in helping engineers to understand the different classes of polymeric materials that have been developed and used in the construction industry. This chapter identifies the principles and the process technology involved in polymer modified mortar/concrete, polymer mortar/concrete and in polymer impregnated concrete. Although the technique of polymer impregnation has priced itself out of the market because of the complex process technology involved, its inclusion helps us to understand the different processes through which the polymer cement interaction is achieved.

The one question that often arises with the use of polymers in concrete is the extent of modification of the properties that they impart to the fresh and hardened concrete. These properties are comprehensively discussed in a chapter that should give any reader a thorough and detailed picture of the two major classes of concrete–polymer composites, namely, the polymer modified systems and the polymer concretes. It is important to understand their advantages and limitations, and this chapter presents a realistic assessment of these characteristics.

The mechanism of interaction between portland cements and polymer systems depends on the type of composite and the method of incorporation of the polymeric material in the concrete. These interactions are very succinctly discussed in a chapter which should help engineers to understand better the role of the polymer in the concrete system, and the reactions between the cement compounds and polymer dispersions. The book ends with a description of practical applications of all types of concrete–polymer composites.

This book should appeal to both researchers and engineers coming into contact with concrete–polymer technology for the first time. Concrete–polymer systems are not as widely used in the construction industry as their tech-

nical advantages would warrant, and one can only hope that books like this would help to dispel the misunderstandings and misconceptions of the capabilities of polymers in concrete. The text is well-written; it is very readable, and the figures and tables are easy to follow. Each chapter has a good collection of appropriate references, and the book as a whole will be highly informative and very educative.

Materials Science of Concrete IV, edited by J. Skalny and S. Mindess, The 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 objective of this series is to present state-of-the-art reviews on topics which are in the forefront of the 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, both 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 10 chapters. The first one, 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 CSH measurements. It concludes with an in-depth discussion of the interpretation of the test results. The second chapter, by Sorrentino *et al.* deals with hydration of calcium aluminates. It addresses the hydration of pure compounds, 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 superplasticification 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 modeling 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 to 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.* It deals with the theory, test methods, 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, 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 both with the scientific concepts and the engineering implications. Creep and damage are dealt with in the ninth chapter authored by Bazant. It addresses the modeling issues based on the extensive studies of the author. The 10th and final chapter, by Spellman and Skalny, deviates from the previous ones, as it deals not with a scientific problem but rather addresses 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 it 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 will get involved.

This book is thus an excellent compilation of state-of-the-art topics 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 gone to great efforts to produce excellent illustrations which