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BOOK REVIEW

"FRACTURE MECHANICS OF CEMENTITIOUS MATERIALS". B. Cotterell and Y.W. Mai. Blackie Academic & Professional, an imprint of Chapman & Hall 1996; 294 p. ISBN 0-7514-0036-X

The intention of the authors was to bridge a gap with this book and discuss fracture mechanics of cementitious materials and fracture mechanics of their fibre composites together.

Cementitious materials are often assumed to have negligible strength in tension. As it is shown in this book this assumption has prevented the efficient use of these materials for many years. Fibres are usually added to improve tensile properties and the capacity for impact energy absorption. These fibres can be long (continuous) or short (discontinuous) and may be steel, carbon, aramid, glass, polypropylene, polyethylene, nylon, cellulose, cotton, sisal, bamboo etc.

In fibre reinforced cementitious materials there is a large *fibre bridging zone* in addition to the *fracture process zone* intimately associated with the tension-softening characteristics of the cement matrix. Fracture mechanics description of the failure of fibre reinforced cementitious materials has to include both the fibre process zone and the fibre bridging zone. The constitutive relationship of the fibre bridging zone will depend on the geometric dimensions of the fibres and the nature and physicomechanical properties of the fibre-matrix interface. Generally, a strong bond is required for high composite strength and a week bond is needed to achieve a large composite toughness.

The book contains eight chapters.

Chapter 1 presents the fundamentals of both linear elastic and non-linear fracture mechanics theories.

In Chapter 2 the development of fibre process zone in cementitious matrices due to the phenomenon of tensile softening and the fibre bridging zone due to fibre bridging across the crack faces is introduced.

Chapter 3 gives an account of the many experimental techniques appropriate for the measurement of the fibre process zone and the fibre bridging zone.

Chapter 4 summarizes theoretical models for fracture in cementitious materials and Chapter 5 those for fracture in fibre reinforced cementitious materials, respectively.

In Chapter 6 statistical fracture mechanics theories of ideally brittle solids and two-phase materials are given. Fibre reinforcement reduces the scatter of the strength distribution and increases structural reliability.

Chapter 7 presents the strength characteristics of cementitious materials under time-dependent loading from the point of view of both the deterministic single crack theory and the probabilistic statistical multiple crack approach.

In Chapter 8 the application of fracture mechanics to design of concrete structures is demonstrated with case studies.

The book should be of interest as a reference text, to professional engineers, research scientists and concrete technologists who have little knowledge of fracture mechanics and who want to enter this fast developing field. It will be of particular interest to civil, structural and materials engineering postgraduate research students and their supervisors in universities and institutions.

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