Natural Convection

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Buoyant forces play a very important role in a large number of flows found in our environment and in engineering applications. While we have made considerable progress since 1960 in our understanding of these flows, this information has not been collected and documented in a well organized presentation of the subject. It is also recognized that our knowledge of a number of the phenomena involved is so limited that accurate predictions of the rate of heat transfer and details of the flow can not be made at the present time.

In recognition of the importance of natural convection a NATO Advanced Study Institute was held in 1984 to disseminate current information and highlight areas in which there is a critical need for further study. This book is composed of lectures and papers presented at the Advanced Study Institute.

Specific topics discussed include: external boundary layer flows; plane layers; flows in enclosures and in the presence of a stratified fluid; natural convection in porous media and in melting and solidification; and mixed convection. Specific emphasis is also placed upon turbulence modelling and the influence of temperature dependent properties.

Like many proceeding volumes there is an unevenness in the treatment of some of the topics. Of particular interest are the contributions dealing with turbulence modelling, mixed convection, natural convection in melting and solidification process and the summary article dealing with still unsolved problems in natural convection. The editors are to be congratulated for assembling an extremely useful book for those interested in buoyant driven flows.

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Fluidization

J. F. Davidson, R. Clift and D. Harrison

Since the first edition in 1971 of this book, edited by J. F. Davidson and D. Harrison, the field has both expanded and changed in emphasis. It is appropriate, therefore, that a second edition should now appear, edited by J. F. Davidson, R. Clift and D. Harrison, and with the various chapters written by, for the most part, new authors. Indeed, the second edition could well be described as a completely new book.

The editors, in their Preface, state that the basis of the book is to give an account of the science of fluidization, much of this basic science being relevant to industrial practice. Accordingly, technical descriptions of specific applications are not included, except where they assist basic understanding. The theories used are serviceable, and where possible simple, and these theories are compared with experimental results. The book, it is claimed, should appeal to those classes of readers for whom the 1971 volume was intended, namely (1) research workers, (2) engineers working in industry as designers or managers of process plant, and (3) teachers of chemical engineering, both for undergraduate and graduate courses.

Bubble phenomena in fluidized beds have continued to attract much interest. In particular, the phenomenon of fast fluidization has been much discussed: whether a large-diameter bed with an upward gas velocity in excess of the free-falling velocity of individual particles and a throughput of particles does behave differently from a small bed with similar gas and particle velocities—the transfer line reactor—is still controversial, though the applications are industrially important.

The chapters, written by experts in their fields, are largely independent of one another, but can be read separately by anyone who has some basic understanding of what a fluidized bed is. The editors have tried to achieve unification by having common symbols for the more important quantities, with some success. Though they have not been able to achieve cross-referencing from one chapter to another, the excellent author and subject indices go a long way to making up for this.

Since 1971 there have been many new developments, and the editors have included accounts of high-velocity fluidization, particle growth processes, drying, and combustion (particularly fluidized bed combustion of coal). In the latter context, radiative heat transfer and the effect of immersed tubes are specifically dealt with. Spouted beds continue to attract attention, and the growth and coating of particles in fluidized beds is becoming important. References include some for 1983, though unfortunately not all the chapters achieve this. Because the second edition is so concerned with recent developments, much of the basic material in the first edition is not repeated. Consequently, the first edition is complemented, rather than replaced, by the new edition, and the two volumes together form an invaluable source of information on the whole file dof fluidization.

This is an authoritative work, beautifully printed, as it should be at the price. The subjects are well chosen and the chapters written simply and clearly. It will be useful to all working in the field as an excellent collection of research reviews, and the editors are to be congratulated on organizing it.

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