Pergamon

Int. J. Multiphase Flow Vol. 21, No. 5, p. 961, 1995
Elsevier Science Ltd. Printed in Great Britain

BOOK REVIEW

Impinging-Stream Reactors, Fundamentals and Applications, by A. Tamir. Elsevier, Amsterdam (1994). ISBN 0-444-89400-4. Dfl. 595.00, US$ 340.00.

Impinging-streams offer an effective flow configuration for intensifying heat and mass transfer processes between gas–solid, solid–liquid and liquid–liquid systems. The flow vectors of the streams are directed against each other so that the streams collide in a narrow zone where heat and mass transfer between the streams become extremely high.

In spite of the great potential for a variety of technical processes, impinging-stream reactors, to date, have found only a few applications in industry, with the exception of the industry of the former USSR where, from the midsixties, impinging-jet devices have been used for a wide variety of processes. The first monograph on this technology by Elperin appeared in Russian in 1972. It was, however, almost unknown outside the former USSR.

The present book is the first comprehensive description on impinging-jet reactors written in English. It is one of the intentions of the author to describe the physical fundamentals and stimulate applications. Professor Tamir and his group at Ben-Gurion University in Beer-Sheva have been working in the field for many years and have widely contributed, through theoretical and experimental research, to a better understanding of the processes involved.

After a humorous introduction, an explanation on what motivated writing the book, follow the physical principles of impinging-jets. They are laid down in chapters entitled: "Analysis of process improvement and origin of impinging streams", "Classification and configurations of impinging-stream reactors", "Single phase impinging streams", "The behavior of a single particle", "The behavior of a multiparticle system" and "Heat transfer and drying". The following chapters describe processes where impinging-streams can be used effectively. Such processes are: drying of particles, solid–solid and gas–gas mixing, absorption and desorption of gases from liquids, combustion of gas and coal, calcination of phosphate, reaction of emulsions, liquid–liquid extraction, dissolution of solids, ion exchange, dust collection and granulation, evaporative cooling of air. In each of these chapters one finds a thorough assessment of the energy needed to perform the processes. The heat and mass transfer correlations are given as well as the residence time of the particles in the reactor.

For modelling of impinging-stream reactors different approaches, depending on the situation, proved useful and are discussed in detail. These are: the flow behaviour of single particles, Monte-Carlo-simulations in order to incorporate particle collision and the Markov-chain-probability in order to investigate the residence time. A large part of the material is based on experiments performed by Professor Tamir and his group. In the last chapter scale-up with respect to pressure-drop, holdup, mean residence time and heat transfer are treated.

The book is meant as a textbook for courses on impinging-stream reactors in Chemical Engineering. It is also useful for engineers in industry, because it presents the first comprehensive description of a field that offers many chances and challenges for industrial applications in chemical engineering. One might also wish the book to stimulate further research in the field. The many novel ideas and the clear and comprehensive presentation make the book deserve to become well known among Chemical Engineers. The only obstacle for a wider dissemination might be the unusually high price.

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