CONTENTS

FOREWORD

Professor K. S. N. Raju has presented the technical community with an interesting, valuable, and unique book on the practice of chemical engineering in the broad areas of fluid mechanics, heat transfer, and mass transfer. Based upon his five decades of experience as an educator, researcher, and consultant, Professor Raju has chosen to adopt the question–answer format.

Consider, for example, an engineer faced with the analysis and design of a fired heater. This book on chemical engineering practice immediately answers design questions such as how the tubes are arranged in the furnace and how many rows are usually provided and also the rationale for the optimum design choice. In addition, the book introduces the theoretical background of radiant heat transfer by explaining concepts such as emissivity and absorptivity and key design relationships like the Stefan–Boltzmann equation and Kirchoff's law. Finally, this thorough book presents and resolves operational issues, for example, hot spots, high-temperature creep, corrosion, and tube life. Professor Raju's book equips the practicing engineer with the tools to design a fired heater as well as to diagnose and resolve operational problems.

Radiant Heat Transfer is one of the eight chapters in the section on Heat Transfer, which cover the theory and application of heat transfer in the process industries. In addition to Heat Transfer, the book has two other sections, Fluid Mechanics and Mass Transfer. Each section introduces the theoretical background, describes the applications and equipment, and anticipates and resolves operational issues. The Mass Transfer section introduces underlying concepts (phase equilibria, mass transfer coefficients, correlations involving dimensionless numbers, polymorphic structures), describes applications (absorption, distillation, crystallization, adsorption), and equipment (tray and packed columns, crystallizers, dryers, and membrane modules), and anticipates and resolves operational issues (column flooding, liquid inclusion in crystals). It will be difficult to find an area in the chemical process industries not covered in this comprehensive book!

While this book is wide in scope, it is also quite detailed. As an example, an engineer who drills down into the chapter on crystallization will learn about the factors that restrict the productivity and purity of crystals (agglomeration, liquid impurities inside and outside the crystals, cavitation).

Professor Raju has structured his book in the question–answer format, which he feels stimulates interest in the subject matter and focuses attention on specific topics. I completely agree. As I read the book, I found that it precisely explained concepts and applications in areas where I have some expertise, and also sparked my interest and gave me new understanding in subjects outside my specialization.

The style, structure, preciseness, and clarity of Professor Raju's book are a reflection of his five decades of experience as an educator, researcher, and consultant. As an educator, he has taught graduate and undergraduate students, created and delivered on-site courses for industry, and developed and nurtured new chemical engineering departments. He has published over 90 papers in international journals. His consultancy has covered the chemical, petroleum, petrochemical, and fertilizer industries and government organizations. Professor Raju's students report that his teaching style was always practical, focusing on solving real-world problems rather than just teaching a concept; he invariably used examples from his extensive