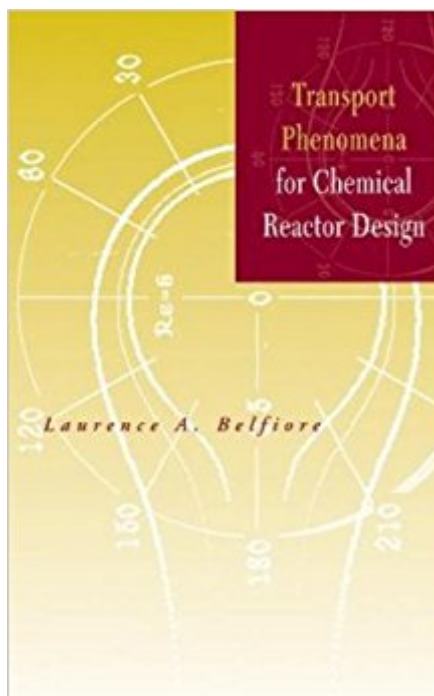


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# Transport Phenomena For Chemical Reactor Design



## Synopsis

Laurence Belfiore's unique treatment meshes two mainstream subject areas in chemical engineering: transport phenomena and chemical reactor design. Expressly intended as an extension of Bird, Stewart, and Lightfoot's classic *Transport Phenomena*, and Froment and Bischoff's *Chemical Reactor Analysis and Design, Second Edition*, Belfiore's unprecedented text explores the synthesis of these two disciplines in a manner the upper undergraduate or graduate reader can readily grasp. *Transport Phenomena for Chemical Reactor Design* approaches the design of chemical reactors from microscopic heat and mass transfer principles. It includes simultaneous consideration of kinetics and heat transfer, both critical to the performance of real chemical reactors. Complementary topics in transport phenomena and thermodynamics that provide support for chemical reactor analysis are covered, including: Fluid dynamics in the creeping and potential flow regimes around solid spheres and gas bubbles The corresponding mass transfer problems that employ velocity profiles, derived in the book's fluid dynamics chapter, to calculate interphase heat and mass transfer coefficients Heat capacities of ideal gases via statistical thermodynamics to calculate Prandtl numbers Thermodynamic stability criteria for homogeneous mixtures that reveal that binary molecular diffusion coefficients must be positive In addition to its comprehensive treatment, the text also contains 484 problems and ninety-six detailed solutions to assist in the exploration of the subject. Graduate and advanced undergraduate chemical engineering students, professors, and researchers will appreciate the vision, innovation, and practical application of Laurence Belfiore's *Transport Phenomena for Chemical Reactor Design*.

## Book Information

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## Customer Reviews

"In addition to its comprehensive treatment, the text also contains 484 problems and 96 detailed solutions to assist in the exploration of the subject." (Chemical Engineering Progress, March 2004) "...an amazing book; almost every topic that arises in the design of a chemical reactor is discussed.... Highly recommended." (Choice, Vol. 41, No. 3, November 2003)

The first complete, combined study of these two vital disciplines Laurence Belfiore's unique treatment meshes two mainstream subject areas in chemical engineering: transport phenomena and chemical reactor design. Expressly intended as an extension of Bird, Stewart, and Lightfoot's classic Transport Phenomena, and Froment and Bischoff's Chemical Reactor Analysis and Design, Second Edition, Belfiore's unprecedented text explores the synthesis of these two disciplines in a manner the upper undergraduate or graduate reader can readily grasp. Transport Phenomena for Chemical Reactor Design approaches the design of chemical reactors from microscopic heat and mass transfer principles. It includes simultaneous consideration of kinetics and heat transfer, both critical to the performance of real chemical reactors. Complementary topics in transport phenomena and thermodynamics that provide support for chemical reactor analysis are covered, including: \*

- \* Fluid dynamics in the creeping and potential flow regimes around solid spheres and gas bubbles
- \* The corresponding mass transfer problems that employ velocity profiles, derived in the book's fluid dynamics chapter, to calculate interphase heat and mass transfer coefficients
- \* Heat capacities of ideal gases via statistical thermodynamics to calculate Prandtl numbers
- \* Thermodynamic stability criteria for homogeneous mixtures that reveal that binary molecular diffusion coefficients must be positive

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It was Klavs Jensen who argued in 1988 that "in its broader sense, chemical reaction engineering is transport phenomena combined with chemical reactions, with the aim of designing a reactor or optimizing a reactor". The first book to cover this subject was Sherwood and Pigford (Chapter IX of

Absorption and Extraction, 1952). In 1967, Astarita published "Mass Transfer with Chemical Reaction", and in 1970 Danckwerts published a monograph ("Gas-Liquid Reactions") dealing with the solution of the diffusion equations for various kinds of geometrical arrangements and kinetic relations". In the present book, Laurence Belfiore attempts an extension of the "BSL" (1960) and "Froment & Bischoff" (1979) books.

Dr. Belfiore did a great job with this book. I will admit I am biased, I helped review it. However I was an undergrad while I did, and he explains the complexities of transport and reactor design in a way that is easily understood by all. This book could very well be used as the graduate transport and reactor design text. It lacks the a chapter on the very basic fundamentals to be used exclusively by undergrads, however with a little background this book will suit those students as well.

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