

# Preface

The goal of enhancing heat transfer while minimizing pressure drops and reducing the size and volume of energy conversion/thermal management systems has been the subject of intensive research for more than four decades. But growing energy demands, the need for increased energy efficiency and materials savings, space limitations for device packaging, and increased functionality and ease of unit handling have created revolutionary challenges for the development of high-performance, next-generation heat and mass exchangers. Among various techniques, innovative microchannel heat and mass exchangers appear to be the most promising way to meet these challenges in thermal management. When properly designed and utilized, microchannels can distribute the flow precisely among the channels, reduce flow travel length, and establish laminar flow in the channels while achieving high heat transfer coefficients, high surface area-to-volume ratios, and reduced overall pressure drops. These are among the major advantages of microchannels for use in a diverse range of industries. Current research on microchannels may represent only the tip of the iceberg of future possibilities for their expanded use. Rapid advancements in micro-machining and micro-deformation techniques are reducing the cost of fabrication while improving the reliability of microchannel systems, thus minimizing one of the main limitations of microchannels.

This book focuses on the latest developments in microchannel heat and mass exchangers, with a particular focus on presenting fundamental research results of practical significance. This book is divided into three chapters. [Chapter 1](#) focuses on the fundamentals of microchannels, their classifications, fabrication techniques, and the design correlations of single-phase and two-phase heat transfer and pressure drops in microchannels. [Chapter 2](#) introduces next-generation force-fed microchannels for high flux cooling applications, including the respective heat transfer and pressure drop characteristics of single-phase and two-phase flow systems. Finally, [Chap. 3](#) discusses emerging applications of microchannels for both heat and mass transfer applications. Because one of the main objectives of

this book is to introduce the latest information in the field, a conscious effort has been made to minimize coverage of related information that otherwise can be found in standard texts or technical references available in the open literature.

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