Preface

This book is among the first ones to address novel process intensification technologies, based on integrated reactive separations, for the production of biodiesel—a mixture of fatty esters. Biodiesel is a biodegradable and renewable fuel, emerging as a viable alternative to petroleum diesel. Conventional biodiesel processes still suffer from problems associated with the use of homogeneous catalysts (e.g. expensive neutralization and separation, salt waste streams) and the limitations imposed by the chemical reaction equilibrium, thus leading to severe economical and environmental penalties.

This book provides a detailed overview illustrated with several industrially relevant examples and case studies of novel reactive separation processes able to tackle the current problems and readily usable in the biodiesel production: reactive distillation, reactive absorption, reactive extraction, as well as membrane reactors and centrifugal contact separators. The integration of reaction and separation into one operating unit overcomes equilibrium limitations and provides key benefits such as reduced investment and operating costs, as well as lower plant footprint. These processes can be further enhanced by heat integration and powered by heterogeneous catalysts, to eliminate all conventional catalyst-related operations, using the raw materials and the reaction volume efficiently, while offering higher conversion and selectivity, and high energy savings compared to conventional biodiesel processes.

The focus of the book is on key aspects of these novel process intensification technologies, ranging from the working principles to conceptual design, process control, and applications. This work includes a number of novel applications relevant to industrial biodiesel and fatty esters processes, as well as results of rigorous steady-state and dynamic process simulations. The readers will have the opportunity to learn about the basic working principles, design and control of such integrated processes, while also getting a modern overview of the process intensification opportunities for biodiesel synthesis. The target audience consists primarily of students and postgraduates, chemical engineers, researchers, project leaders, technology managers, biodiesel manufacturers, and equipment suppliers.

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