



# Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis

*Jhuma Sadhukhan, Kok Siew Ng, Elias Martinez Hernandez*

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As the range of feedstocks, process technologies and products expand, biorefineries will become increasingly complex manufacturing systems. *Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis* presents process modelling and integration, and whole system life cycle analysis tools for the synthesis, design, operation and sustainable development of biorefinery and chemical processes.

Topics covered include:

**Introduction:** An introduction to the concept and development of biorefineries.

**Tools:** Included here are the methods for detailed economic and environmental impact analyses; combined economic value and environmental impact analysis; life cycle assessment (LCA); multi-criteria analysis; heat integration and utility system design; mathematical programming based optimization and genetic algorithms.

**Process synthesis and design:** Focuses on modern unit operations and innovative process flowsheets. Discusses thermochemical and biochemical processing of biomass, production of chemicals and polymers from biomass, and processes for carbon dioxide capture.

**Biorefinery systems:** Presents biorefinery process synthesis using whole system analysis. Discusses bio-oil and algae biorefineries, integrated fuel cells and renewables, and heterogeneous catalytic reactors.

**Companion website:** Four case studies, additional exercises and examples are available online, together with three supplementary chapters which address waste and emission minimization, energy storage and control systems, and the optimization and reuse of water.

This textbook is designed to bridge a gap between engineering design and sustainability assessment, for advanced students and practicing process designers and engineers.

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