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Chemical Process Design

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Advances and Emerging Directions in Chemical Process Design

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Editor-in-Chief Lecture

It is our pleasure to present Volume 5, Issue 1 (2026) of Chemical Process Design. This issue continues the journal's mission to publish high-quality research that advances the design, modeling, optimization, and economic evaluation of chemical and energy-related processes. The articles included in this issue reflect the evolving landscape of modern chemical engineering, where process efficiency, sustainability, advanced simulation, and interdisciplinary approaches play increasingly important roles in both academic research and industrial practice. Several contributions in this issue focus on process simulation, design optimization, and energy efficiency in industrial systems. Studies on gasoline isomerization units and LPG recovery processes investigate how simulation tools such as Aspen HYSYS, together with pinch analysis, can enhance operational performance and reduce energy consumption in refinery operations. In a related area, research on quaternary hydrocarbon distillation demonstrates how integrated heat recovery, exergy analysis, and CO_2 emission assessment can significantly improve the sustainability of separation processes. Another contribution evaluates a side-absorber distillation column for ethanol extractive dehydration, presenting a promising alternative to conventional configurations with lower energy demand and reduced solvent consumption.

A second group of papers highlights the growing importance of computational modeling and fluid dynamics in process engineering. CFD-based investigations explore drag reduction in crude oil pipelines using Nano-silica Nano fluids, pressure and velocity characteristics in spinning cone columns, and the performance of sinusoidal micro channels designed for blood plasma separation. These studies demonstrate the capability of advanced numerical methods to predict complex transport phenomena and to support the development of more efficient industrial and biomedical devices.

Energy transition and emerging technologies are also addressed in this issue. A simulation-based evaluation of an anion exchange membrane (AEM) electrolysis system provides insights into the design and performance of green hydrogen production units, emphasizing the role of renewable energy in future process industries. Complementary research examines the thermodynamic modeling of wax formation in petroleum systems, which remains a critical operational challenge in oil production and transportation. Additional studies include thermal-hydraulic modeling of test loops for pressurized water reactors, equipment design for acid-activated bentonite production, and an economic analysis of investment strategies in major oil fields. Together, these contributions illustrate the broad scope of modern process design—from fundamental thermodynamic modeling and fluid dynamics to industrial optimization, sustainability assessment, and economic evaluation.

We hope that the findings presented in this issue will provide valuable insights for researchers, engineers, and practitioners working toward the development of more efficient, reliable, and sustainable chemical processes.

We sincerely thank the authors for submitting their valuable work to Chemical Process Design. We also extend our appreciation to the reviewers for their careful evaluations and constructive feedback, and to the members of the editorial board for their continued dedication to maintaining the scientific quality of the journal. We hope that this issue will stimulate further research and collaboration in the field of chemical process design.

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