Editorial

Special Issue "Feature Papers"

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The Special Issue "Feature Papers" of the journal *Processes* aims to establish the scope of this new open access journal in chemical, biological, environmental, pharmaceutical, and material-process engineering, as well as the development of general process engineering methods. The Special Issue is available online at: http://www.mdpi.com/journal/processes/special_issues/feature-paper.

Chemical Process Engineering

A major focus of *Processes* will be chemical process engineering with applications to both traditional industries and emerging industries for renewable chemicals and energy production. The special issue begins with a data driven study on the optimization of chiller plants at the University of Texas at Austin, where the solution of a multi-period optimal loading problem is shown to reduce energy costs by 8.57% [1]. Also energy related, the second paper focuses on transport modeling of molecular sieve cobalt oxide silica membranes for hydrogen processing, and demonstrates that multi-tube membrane modules should be designed to maintain an appropriate driving force for hydrogen permeation [2]. The third paper addresses the emerging problem of biodiesel process design through the development and screening of a generic superstructure that captures all possible process alternatives based on available technology [3]. This topic area is completed with the fourth paper, which reports the viscosity and density of diesel fuels obtained from British refineries at elevated pressures up to 500 MPa and temperatures in the range 298 K to 373 K [4].

Biological and Environmental Systems Engineering

The development of process engineering technology for biological and environmental applications is envisioned as a major focus area of *Processes*. The first paper in this area concerns the development of a mathematical model of a multi-stage flash desalination process that is used to minimize the total daily operating cost by optimizing the number of stages, seawater rejected flowrate and brine recycle flowrate [5]. In the second paper, a cybernetic model of *Escherichia coli* growth on mixed substrates is

subjected to bifurcation analysis and theoretically shown to exhibit a steady-state multiplicity up to seven [6]. The third paper reviews the history of Chinese hamster ovary (CHO) cells commonly used to manufacture protein pharmaceuticals and argues that CHO cells are a prototypical example of a "quasispecies" due to their exposure to high mutation rate environments [7]. Finally, the fourth paper in this area reports on the development and experimental validation of a cell simulator that uses event-based stochastic simulations to capture transcription, translation, and trafficking events to predict protein expression dynamics [8].

Pharmaceutical Process Engineering

Innovative process engineering methods for pharmaceutical manufacturing including new approaches for process analytical technology (PAT) and quality by design (QbD) is expected to represent a core area for *Processes*. The special issue contains two papers that focus on pharmaceutical process engineering. The first paper provides a review of computational models and methods, which have applications to the continuous manufacturing of solid dosage forms [9]. In the second paper, a strategy for optimal-averaging level control of storage tanks in continuous pharmaceutical manufacturing processes is developed and shown to strongly outperform conventional PI control via simulation studies [10].

Materials Process Engineering

The development of advanced materials and scalable processes for their manufacture is envisioned to be an important research area of *Processes*. The first paper in this area addresses the problem of developing biocompatible positive photoresists for photochemical patterning to manipulate cell cultures through cell growth on the surface or entrapment within the hydrogel [11]. The next paper continues the soft materials theme, providing a review of temperature responsive thermophilic hydrogels with tunable stimuli-responsive properties [12]. In the next paper, strategies for immobilizing titanium oxide powder as thin films on polymer substrates are developed and evaluated for the photocatalytic degradation of acetylsalicylic under both UV and solar light irradiation [13]. The area of hard materials is addressed in the next paper, where a mathematical model of a laboratory-scale atomic layer deposition reactor system is developed and used to discover limit cycle solutions and to gain insight into the effects of reactor design on deposition performance [14].

Process Engineering Methods Development

A major emphasis of *Processes* will be the publication of papers that present generally applicable methods for process modeling, analysis, control and optimization. The final two papers of the special issue address the development of such process engineering tools. In the first paper, an automated method for generating reduced order models of complex reaction systems using the approach of diffusion maps is developed and applied to an illustrative turbulent combustion problem [15]. The final paper is focused on the formulation of general iterative controller tuning as a real-time optimization problem and the application of the proposed scheme for tuning model-predictive, general fixed-order and PID controllers for both simulated and experimental systems [16].

The Future of Processes

The Special Issue covers a broad range of topics consistent with the mission of *Processes* to become a highly visible outlet for the publishing of novel process engineering methods and application studies. The journal will continue to solicit high quality contributions in chemical, biological, environmental, pharmaceutical, and material-process engineering.

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