Special Issue on “Membrane Materials, Performance and Processes”

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Editorial

Special Issue on "Membrane Materials, Performance and Processes"

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This Special Issue on "Membrane Materials, Performance and Processes" of *Processes* provides a collection of interdisciplinary work representative of the current development in the fields of membrane science and technology.

Starting with processes for industrial application, several papers reported on the use of membranes as membrane reactors, particularly in energy applications. A review paper from Plazaola et al. [1] reports on the latest developments of mixed ionic electronic membranes, which are ceramic dense membranes for oxygen separation, and their integration into chemical production processes. Another gas of importance in energy is hydrogen, which is generally processed from syngas plants. This type of work was addressed by Leimert et al. [2], who investigated the potential of methane dry reforming by using nickel membrane reactors. These papers demonstrate the potential of coupling membranes and reactors in a single unit operation.

Process system engineering were reported for hydrogen production. Mores et al. [3] developed optimisation tools to assess the deployment of two-stage membrane systems for hydrogen separation from off-gases in hydrocarbons processing plants. This was aimed to simultaneously attain high values of both hydrogen recovery and product purity. On the same application, Arias et al. [4] used a nonlinear mathematical programming (NLP) to simulate and optimise membrane configuration and operation conditions. In another application, Estay et al. [5] studied cyanide recovery from gold mining industries, an important environmental application, focusing on industrial hollow fiber membrane contactor module. All these reports considered the engineering economics, an important assessment for the deployment of membranes in industrial applications.

Fouling is a major problem in membrane operations, plugging membrane surfaces and pores, and reducing membrane performance. Martin Vincent et al. [6] investigated fouling in anaerobic membrane bioreactor (AnMBR) equipped with a tubular membrane for treating domestic wastewater, including cleaning strategies. In another work, Utoro et al. [7] synthesised mixed matrix membranes containing natural seeds as a strategy to reduce fouling in membranes for food production. These works demonstrate potential anti-fouling strategies that can be applied to tackle this serious problem in membrane technology.

This special issue also shows the effect of materials on the performance of membranes. Tan et al. [8] studied the intercalation of silver particles in the perovskite grains of dense ceramic membranes to improve oxygen ion conduction. In another work, Song et al. [9] investigated the effect of porous ceramic substrate in the formation of porous carbon membranes for desalination application. Gel packed columns were also studied by Takaoka et al. [10] for filtering graphene oxide and by Miyoshi et al. [11] for filtering silica particles. These works report the fundamental relations between materials, structures and performance in terms of fluxes and selectivities.

The above papers demonstrate the interdisciplinary fields of membrane science and technology, covering materials, chemistry and chemical engineering. They also clearly show the versatility of

membrane application in energy, mining, desalination, food production and wastewater treatment. In addition, the above papers clearly indicate the flexibility of using different materials ranging from ceramics (porous and dense), to carbon, mixed matrix membranes and gel columns. Within the major focus of this special issue, we believe that much remains to be explored as the field of membrane science and technology continues to expand.

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Julius Motuzas
João C. Diniz da Costa
Guest Editors

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