Chemical Engineering and Processing: Process Intensification

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1. Most Downloaded

Nanomaterials-based advanced oxidation processes for wastewater treatment: A review

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Abstract

Over the past decades, advanced oxidation processes (AOPs) for wastewater treatment drawn a great deal of attention of the researchers. AOP's are one of the promising advanced technologies to destroy the total organic content, toxic pollutants etc. from the wastewater. A number of attempts has been made from the past two decades on the waste water treatment using various advanced oxidation treatment techniques. The main objective of this review article is to provide the quick reference for researchers and academicians in the area of wastewater treatment using nanomaterials in conjunction with various AOPs and/or hybrid AOPs. This review article is mainly focused on (1) the nanomaterials-based individual and hybrid AOPs for treatment of various industrial effluents or model effluents, (2) the current status of work in the area of hybrid nanomaterials as heterogeneous catalysts combined with AOPs and hybrid advanced oxidation processes.

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2. Recent Article

Coupling of in-situ pervaporation for the enhanced esterification of propionic acid with isobutyl alcohol over cenosphere based catalyst

Abstract

In the present work, pervaporation assisted esterification of propionic acid and isobutyl alcohol, to produce isobutyl propionate and water was investigated in an in-situ type pervaporation reactor. A commercial polymeric hydrophilic PVA-PES membrane was used to shift the conversion of equilibrium limited esterification reaction by the removal of water from the reaction mixture. Catalyst developed from cenosphere (waste material) was used in the study. The effects of process parameters viz; reaction temperature, catalyst loading, alcohol/acid molar ratio and a ratio of effective membrane area to initial reaction volume (S/V) were studied.

Catalyst characterization elucidated that the catalyst exhibited significant silica content, surface acidity with a considerable surface area. The membrane showed a significant selectivity towards the water removal which subsequently enhanced the pervaporation performance. A substantial enhancement in the conversion of esterification reaction from 67% to 88% was observed by the incorporation of pervaporation at a temperature of 353 K. The membrane and catalyst revealed a significant stability up to four and three reaction runs respectively. Results revealed that all process parameters linearly affected the conversion and permeate flux of pervaporation assisted esterification. The maximum esterification conversion was obtained to be 92% at a reaction temperature of 353 K, catalyst loading of 20 g/L, alcohol/acid molar ratio of 2.5 and S/V ratio of 19.63 m^{-1}.

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3. Most Cited

Intensification of extraction of natural products using ultrasonic irradiations-A review of current status

Abstract

Extraction of active chemical compounds from natural products is one of the most important research areas for pharmaceutical and chemical industries. Traditional techniques used for the solvent extraction of natural products are associated with longer extraction times and lower yields, use of large amount of organic solvents and poor extraction efficiency. Ultrasound can be effectively used to improve the extraction rate by increasing the mass transfer rates and possible rupture of cell wall due to formation of microcavities leading to higher product yields with reduced processing time and solvent consumption. The present work presents an exhaustive overview of different aspects of ultrasound assisted extraction (UAE) of various natural products. Mechanism of UAE has been discussed and recommendations for optimum operating conditions have been reported for maximizing the yield. An

overview of different applications of UAE has been also presented. Possible intensification of UAE by coupling with traditional solvent and supercritical extraction processes has also been discussed. Overall it appears that ultrasonic irradiations can be effectively used for intensification of the extraction of important constituents from natural products.

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4. Open Access Article

مقاله ی زیر بصورت کامل قابل دریافت و درصورت تمایل قابل ترجمه می باشد

A review of process intensification applied to solids handling

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Abstract

Process intensification (PI) is a strategy aimed at transforming conventional chemical processes into more economical, productive and green processes. Its fundamental concept hinges upon the volume reduction of processing equipment resulting in enhanced mixing and heat/mass transfer as well as a multitude of other benefits. To date, the focus of PI has been on processes mainly involving gas/liquid systems. Solids handling applications have been more limited as fouling and blockages can occur due to large concentrations of solids in smaller equipment sizes. Appropriately designed equipment is therefore a key consideration for intensifying industrially-relevant solids handling processes.

In this review paper, we highlight a number of solid processing applications including precipitation, separation, granulation and milling, etc. where PI has been demonstrated. Much effort has been directed at reactive crystallization and precipitation in various intensified technologies, exploiting their enhanced mixing capabilities to produce uniformly distributed nano-particles. Generally, the objective in many of these processes has focused on transforming solids handling in batch processes into continuous ones with processing time reduction and improved energy efficiency. The review highlights the considerable opportunity for further development of multifunctional technologies in solids handling applications such as granulation and drying, the subject of a European Commission-funded HORIZON 2020 project.

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